TECHNICAL SERIES No. 4.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF ENTOMOLOGY.

SOME

MEXICAN AND JAPANESE INJURIOUS INSECTS

LIABLE TO BE

INTRODUCED INTO THE UNITED STATES.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

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LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF ENTOMOLOGY,
Washington, D. C., April 15, 1896.

SIR: I have the honor to submit for publication the fourth number of the technical series of bulletins of this Division. It is composed of a group of articles, chiefly of a descriptive character, which relate to injurious insects liable to be imported into the United States.

Respectfully,

L. O. HOWARD,
Entomologist.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

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INTRODUCTION.

Of the articles which compose this bulletin, three relate to Mexican insects, one specifically to Japanese insects, and two to insects which enter the port of San Francisco, mainly from Japan but also from other Pacific ports, principally those of Hawaii and Australasia. In a paper read before the Peninsula Horticultural Society, at Dover, Del., on January 11, 1895, and published in Insect Life (vol. VII, pp. 332–339), the writer called especial attention to the great and constant danger of the importation of injurious insects new to the United States, and sounded an especial note of warning regarding the Mexican border. One of his first official acts on assuming charge of the Division of Entomology in June, 1894, was to secure the temporary appointment of Prof. C. H. Tyler Townsend to conduct a brief investigation of the injurious insects of northern Mexico which are liable to be carried across the border, and the first three papers of this bulletin give the technical results of this short investigation, the first paper, by Professor Townsend himself, possessing also some popular interest. The whole subject, as a matter of fact, is one which deserves popular as well as technical treatment, and a popular summary may be given at another time. Our danger from Mexico is fast becoming realized. A great influence in bringing about popular appreciation of this danger has been the advent in Texas cotton fields of the Mexican cotton boll weevil, *Anthonomus grandis*, and quite recently resolutions have been adopted by the Board of Control of the New Mexico Agricultural Experiment Station, recommending the stationing of horticultural quarantine officers at southern ports and the appointment of an agent of this Department to study injurious insects in Mexico, Central America, and the West Indies.

There is fortunately not the same danger of the importation of injurious insects from Japan and the Pacific islands that there is from Mexico. This is largely owing to the excellent legislative acts which are in force in California and to the work of the State Board of Horticulture. It is necessary, however, for even the executive officers of the State Board of Horticulture of California to be familiar with the insects which are liable to be imported, and it was with this fact in view that my predecessor in office, Prof. C. V. Riley, secured the services for a short time of Mr. Otoji Takahashi, a Japanese entomologist who had been trained by Prof. J. H. Comstock at Cornell University, to conduct a short investigation, particularly of the scale insects affect-

ing citrus plants. Mr. Takahashi's employment was brief, and he was unfortunately situated at a great distance from the orange-growing region. He secured, however, several interesting scale insects, which are described by Professor Cockerell in the concluding article of the series. Of the injurious insects of Japan other than scale insects we should have a more explicit knowledge. We already know of the existence there of a larva affecting the peach, an account of which was given in Insect Life (vol. II, pp. 64–66), which would be a most undesirable importation. We also know that the Japanese gypsy moth, *Ocneria japonica*, if accidentally introduced into this country, might prove as serious a pest as the European gypsy moth has shown itself to be in Massachusetts. But with other injurious insects of this and other orders we are more or less unfamiliar. Further investigations in this line are, therefore, very much to be desired.

In 1893 a large collection of unnamed Japanese insects of different orders was exhibited at the Chicago Exposition by Dr. K. Mitsukuri, of the Imperial University, Tokyo, Japan. This collection was deposited in the U. S. National Museum at Washington, and is now being named by specialists in different orders. Many of the insects are undoubtedly injurious, but we have no notes of their exact habits. Quite recently a small lot of Japanese insects was sent to the writer by Mr. M. Matsumura, of the Sapporo Agricultural College, who is taking up economic entomology, and as these specimens were accompanied by notes as to food plants the sending was an exceptionally interesting one. Among them the following are of especial interest:

Spilodes kodzukalis Holland MS.; very injurious as a stalk borer to grasses.

A species of Ancylolomia very like our *Chilo oryzæellus;* very injurious to rice stalks as a borer.

Rhodophæa hollandella Ragonot; rolling the leaves of pear.

Nephopteryx rubrizonella; boring into the fruit of pear.

Cacœcia rosaceana Harris; rolling leaves of apple. (This species occurs abundantly in this country.)

Hyponomeuta sp.; eating the leaves of apple and pear.

Orgyia gonostigma (a common European species); eating the leaves of apple and pear.

Laverna? sp.; very injurious to apple, working in the fruit like the codling moth and spinning its cocoon in the earth.

Exartema? sp.; an injurious bud moth of the mulberry tree.

Tinea sp.; near *granella;* attacking stored rice.

Myelois sp.; attacking stored grain.

Bombyx mandarinus Moore (the species which is believed to be the wild form of the silkworm of commerce); eating the leaves of the mulberry tree.

Stenobothrus bicolor Charp. (?); a grasshopper which is very injurious to vegetation in general.

Parapleurus alliacus Germ. (?); another grasshopper which attacks the rice plant.

Sitodrepa panicea (cosmopolitan); very troublesome to stored food. (One specimen of *Ptinus fur* was found with the preceding.)

Tabanus sp.; attacking domestic animals.

The Lepidoptera of this collection were examined by Rev. Dr. W. J. Holland, who has given us most of the names, and the two grasshoppers were named by Professor Bruner.

The publication of the list of scale insects found upon plants entering the port of San Francisco, by Mr. Alexander Craw, quarantine officer and entomologist of the State Board of Horticulture of California, renders this bulletin far more complete than it could otherwise have been made, and Mr. Craw's courtesy in furnishing this list is highly appreciated. The technical descriptions of new forms found by Mr. Craw have been drawn up by Professor Cockerell, to whom they were sent by Mr. Craw with the request that the manuscript be forwarded to this office for publication in this bulletin.

The publication of these technical matters in the present shape is desirable, for the reason that it will place upon record facts and descriptions concerning the species mentioned which will enable an entomologist to recognize any of the forms discussed, in case at any time they appear or establish themselves in any part of the country. Thus, if an injurious scale insect is brought to the attention of the entomologist of the Louisiana Experiment Station, for example, and he finds that it is new to his locality, he can probably, by consulting these pages, ascertain whether it was imported from Mexico or from some other point. Having ascertained that it is an importation, and perhaps a recent one, the necessity for exterminating, and not palliative remedial work, will be at once apparent.

Further investigations of this character are, as stated above, very much to be desired. Results of more immediate value are, however, to be obtained on other lines of work, and the Entomologist has felt loath to recommend the spending in this direction of more than a very small part of the funds at his disposal.

L. O. H.

SOME MEXICAN AND JAPANESE INJURIOUS INSECTS LIABLE TO BE INTRODUCED INTO THE UNITED STATES.

REPORT OF A TRIP TO INVESTIGATE INSECTS OF ECONOMIC IMPORTANCE IN MEXICO.

By C. H. Tyler Townsend,
Temporary Field Agent, Division of Entomology.

LETTER OF SUBMITTAL.

Las Cruces, N. Mex., *October 31, 1894.*

Sir: I have the honor to submit the inclosed report on my investigations of economic insects in Mexico, made between September 20 and October 20, 1894. Pursuant to your instructions, I visited most of the principal agricultural districts situated along the railroads over the plateau region, and also visited the ports of Guaymas and Tampico. On growing crops little else was met with besides scale insects (Coccidæ) and their enemies. These are of the utmost economic importance, and, therefore, were carefully collected and are all mentioned in this report, whether found on crops or other plants. Whenever practical, ranches and plantations of importance in the vicinity of stopping places were visited and thoroughly inspected; but when the distance was so great or the time so short as to render such trips impracticable the time was devoted to the inspection of all available plazas, gardens, patios, etc., in the different places visited. The idea was constantly kept in mind that those species which occurred in regions from which much produce was shipped were more likely to become imported, and inquiries were made of proper authorities in this regard.

Very respectfully, yours,

C. H. Tyler Townsend,
Temporary Field Agent.

Mr. L. O. Howard,
Chief, Division of Entomology,
U. S. Department of Agriculture.

INTRODUCTORY.

The present report treats of such insects of economic importance as could be found in Mexico in the limited time at my disposal for visiting the different agricultural districts, and which stand any chance of being introduced into the United States. Only such regions as are situated along the railroads were visited, ports excepted, as from these only would pests be liable to reach our country through shipment of fruit, produce, plants, etc. Enemies of injurious insects were collected

wherever found, and some of these may prove of importance for introduction, i. e., certain enemies of scale insects.

My thanks are due to Mr. Charles E. Hale, American vice-consul at Guaymas; Hon. John Maguire, American consul at Tampico; Señor U. Ferreira, of Hermosillo, a well-informed man on scale insects of the orange; and to many others for favors shown and assistance given.

All of the material outside of the Coccidæ was determined by the Department in Washington—the Encyrtinæ and Aphelininæ by Mr. Howard, the Coleoptera by Mr. Schwarz, and the few Diptera by Mr. Coquillett. The plants were determined by Mr. Coville. My thanks are due to these gentlemen, and also to Prof. T. D. A. Cockerell, of Las Cruces, N. Mex., who at first looked over the coccids superficially and furnished me comments and notes upon them. They were then worked over by Mr. Pergande, who determined the most of the described species. The new species were afterwards described and named by Professor Cockerell, and appear in a paper at the end of this report. I should also mention that a considerable part of the list of Mexican Coccidæ was made from data furnished me by Mr. Cockerell.

SCALE INSECTS (COCCIDÆ).

The scale insects form the major portion of the material secured, and will be treated first under the head of each species. Following this will be given a list of species found on each plant infested.

1. *Icerya purchasi* Mask.—This species was found only on citrus fruits, principally orange, at Guaymas, Hermosillo, and Magdalena in the State of Sonora; at Victoria in Tamaulipas, and at Monterey in Nuevo Leon.

In Guaymas it was found very bad on about six orange trees at Aranjuez, at a place formerly known as San Jose de Guaymas. On trunk, twigs, and leaves, September 23.

Señor U. Ferreira informed me that the Icerya has been seen on grapes at Hermosillo; and further, that no other scale has ever occurred on orange in Hermosillo except the Icerya. The same gentleman informed me also that when the Icerya on the orange was shown to the native Mexicans, they replied that they had previously observed the same on the mesquite, but the latter was probably a different species.

At Hermosillo it was found in the plaza on orange, and very sparingly in the orange orchards of that vicinity. At Magdalena it was found in great abundance on some orange trees in the patio of a hotel and in the plaza, and on one lime tree in the same place. At Victoria it was found in large numbers on orange; October 16 on leaves along midrib on underside. At Monterey it occurred on orange trees in one of the plazas.

This species is found elsewhere in California, Florida, Australia, New Zealand, South Africa, and the Sandwich Islands.

2. *Orthezia sonorensis* Ckll. n. sp.—Found numerously near San Ignacio, Sonora, September 26, on plant called "gecota," *Hymenoclea monogyra*. This is a large species of Orthezia, larger than any hitherto known.

3. *Orthezia insignis* Dougl., var.—Found abundantly on many orange trees in Guadalajara, October 9 and 10, in different parts of the city. In Aguas Calientes it was extremely abundant on a small lime tree October 11, covering the whole tree. A single specimen was also found on tomato.

The true *insignis* is found out of doors only in Jamaica, Trinidad, and Demerara. It occurs in hothouses in Europe and America. A variety, probably the same, was found in Vera Cruz by Cockerell.

4. *Chionaspis citri* Comst.—Found abundantly in Tampico, October 14, on orange. It was very bad on leaves, fruit, twigs, and bark of trunk and branches; also badly infesting tangerine orange in Tampico.

This species is found elsewhere in Cuba, Louisiana, Trinidad, Demerara, Australia, and New Zealand.

5. *Ceroplastes ceriferus* Anders.—This was found in Cuautla on red-flowering Hibiscus, badly massed on branches in plaza, October 7. A lepidopterous larva was found preying upon it.

This species furnishes the Indian white wax, and occurs elsewhere in India, Australia, Antigua, and probably Brazil. It has been collected in Guanajuato, Mexico, by Dr. A. Dugès.

6. *Ceroplastes mexicanus* Ckll. n. sp.—San Luis Potosi, October 12, on Catalpa. Adult scales found singly on branches, and what appear to be the young on upper side of leaves. Also found on *Tecoma stans* at Guaymas, September 24.

7. *Aspidiotus ficus* Ashm.—Very bad on fruit and leaves of orange in plaza in Tampico, October 14. Also very bad on tangerine orange in Tampico. Also bad on orange in Matamoras, December 9. In Chihuahua, on leaves of tree called "palo dulce."

This species occurs elsewhere in Florida, Cuba, Jamaica, and Australia. It has been recorded from Vera Cruz, Mexico, by Cockerell.

8. *Aspidiotus nerii* Bouché.—Very bad on oleander in Chihuahua and Aguas Calientes; also on shrub called "trueno" in Aguas Calientes and San Luis Potosi. Massed on branches of rose in Chihuahua. On leaves of olive and "palo dulce" in Chihuahua. On *Yucca aloifolia* ? (young plants in pots), in Guadalajara.

This species is almost general in distribution, yet, strange to say, has never been found in the West Indies.

9. *Aspidiotus articulatus* Morg.—On orange in Tampico, October 14, associated with *A. ficus*.

Occurs also in Jamaica, Barbados, Nevis, Trinidad, and Demerara; collected by Cockerell in Vera Cruz.

10. *Aspidiotus scutiformis* Ckll.—Abundant on leaves of orange in Victoria and Monterey; also on leaves of pomegranate in Monterey. In the latter place it was especially bad on almost all of the orange trees in all the plazas of the city, the fruit and leaves being simply massed with it.

11. *Aspidiotus* n. sp.—Thickly massed on bark of limbs and twigs of tree said to be avocate (avocado pear). San Luis Potosi, October 12.

12. *Aspidiotus* n. sp.?—On leaves of tree known as "bagote." Hermosillo, September 25. The material was not in sufficient quantity for description.

13. *Aspidiotus nigropunctatus* Ckll. n. sp.—On "trueno." San Luis Potosi, October 12.

14. *Aspidiotus* n. sp.?—On leaves of rose. Monterey, October 17. Not enough material for description.

15. *Lecanium oleæ* Bern.—On orange, lime, and Catalpa, San Luis Potosi; on oleander, "marguerita," and Pelargonium, Aguas Calientes; on thorny shrub (hard wood and thorns few), Las Esteros, State of Tamaulipas; bad on leaves, twigs, and branches of fig trees, Monterey; on guava, Nuevo Laredo, December 13. Those found on oleander at Aguas Calientes were all infested with a large parasite. They occurred on leaves and branches. Those on fig at Monterey were also badly parasitized. This species is widely distributed.

16. *Lecanium hesperidum* Linn.—On lime, San Luis Potosi; on orange, Tampico and Chihuahua; on leaves, stems, and twigs of orange trees in sheltered patios in Chihuahua; also very numerously infesting leaves of several large trees of what is known as "fitolaca," in Monterey, October 17. These last were extensively preyed upon by larvæ and adults of *Ozya orbigera*. On guava and rose, Nuevo Laredo, December 13. This species is found in the Sandwich Islands, South Africa, Florida, Jamaica, Chile, etc.

17. *Lecanium imbricatum* Ckll. n. sp.—On Mimosa. Alta Mira (State of Tamaulipas), October 15. Massed on twigs, the scales overlapping each other.

18. *Lecanium* sp. (?)—Several oblong scales on pods of Catalpa, San Luis Potosi, October 12. This species was overlooked at the Department in making the determinations, and is doubtfully referred by me to this genus. The scales occurred singly on the pods.

19. *Pulvinaria* n. sp.?—Found singly on leaves of "fitolaca," at Monterey. With *Lecanium hesperidum*. Specimens were lost in transit to Washington, and were not reported on at the Department.

20. *Aulacaspis rosæ* Bouché.—Thickly massed on rose branches. Chihuahua. Found elsewhere in the United States, Jamaica, Demerara, Europe, New Zealand.

21. *Aulacaspis boisduvalii* Sign.—On *Bromelia pinguin*, a plant nearly allied to the pineapple, growing wild in tropical America and forming impenetrable thickets in southern Tamaulipas. Alta Mira, Tamaulipas. Known in Jamaica, Barbados, and Trinidad.

22. *Mytilaspis gloveri* Pack.—Very bad on leaves and fruit of orange in Tampico, associated with *Chionaspis citri* and *Aspidiotus ficus*. Also on orange in Matamoras, December 9. This species is new to Mexico. It is found elsewhere in Louisiana, Florida, and Southern Europe.

23. *Pseudococcus yuccæ* Coq.—This species was found by me on the following plants in the following localities:

Tlaltizapan (State of Morelos): Sparingly on a lime tree. Mexico City: On tall *Yucca* (*Y. filifera* probably) in Plaza Guardiola; very bad, covering all the leaves; on banana (1892). Guadalajara: On orange, yellow-variegated Agave, banana, Yucca, Caladium. Aguas Calientes: On common red-flowering Pelargonium, and on Amaryllis. San Luis Potosi: On orange, lime, cherimoya, a malvaceous white-flowering tree, a shrub with red, honeysuckle-like flowers and rose-like leaves, Lantana sp., pomegranate, and Catalpa. Tampico: A few on orange. Las Esteros (Tamaulipas): On thorny shrub, October 15. Monterey: Numerous on leaves of fig trees. This species was very bad on all the orange trees in Guadalajara, and very numerous on Yucca, Agave, and stems and leaves of Caladium. In San Luis Potosi it was very bad on green fruit of orange (also on leaves and branches), on lime, and clustered in white masses on the fruit of cherimoya, but not on the leaves of latter. It attacks a great variety of plants.

It occurs elsewhere in California only. Professor Cockerell does not consider it to be a true Pseudococcus, but probably a new genus. Individuals with 8-jointed antennæ were described by Cockerell as *Dactylopius mexicanus*.

24. *Eriococcus dubius* Ckll. n. sp.—Valles, October 13. On twigs of unknown shrub.

25. *Conchaspis angræci* var. *hibisci* Ckll. var. nov.—Found on leaf stems and twigs of *Hibiscus floridanus* in plaza in Tampico, October 14.

C. angræci (typical form) is known only from Jamaica and from hothouses in England.

The following three new species were collected in Ciudad Porfirio Diaz (Piedras Negras), Coahuila, in November, while engaged on an investigation of the cotton boll weevil, and are included (as are other data gained at the same time) in this report so as to complete the account of Mexican scale insects to the present time:

26. *Aspidiotus yuccæ* Ckll. n. sp.—On *Yucca australis* (or a closely allied species). C. P. Diaz. Thickly covering the leaves, especially toward base.

27. *Aspidiotus townsendi* Ckll. n. sp.—On leaves of unknown tree. C. P. Diaz.

28. *Dactylopius olivaceus* Ckll. n. sp.—In cavities in leaves of *Yucca australis*. C. P. Diaz.

Negative results.—In the vicinity of Magdalena, Sonora (at Magdalena and San Ignacio), I examined many grapes, apples, plums, pears,

peaches, figs, apricots, pomegranates, and quinces, but found no scales whatever on any of these in this region. At San Ignacio, which is six miles north of Magdalena and on the railroad also, I could find nothing on orange, lime, etc., though *Icerya purchasi* abounded on the same at Magdalena. Olives in Hermosillo had no scales.

In Chihuahua nothing was found on peaches or pears. Also nothing on shrub called "trueno," which was abundantly infested farther south. Some scales were found on pomegranate at San Luis Potosi and Monterey, but nowhere else on that plant. No scales were found on fig except in Monterey.

No scales were found anywhere in Mexico on peach, pear, apricot, plum, apple, quince, or grape.

LIST OF SCALE INSECTS, ARRANGED BY HOST PLANTS.

AGAVE (yellow variegated).—*Pseudococcus yuccæ.* Guadalajara.

AMARYLLIS.—*Pseudococcus yuccæ.* Aguas Calientes.

AVOCATE (avocado pear).—*Aspidiotus* n. sp. San Luis Potosi.

BAGOTE.—*Aspidiotus* n. sp.? Hermosillo.

BANANA.—*Pseudococcus yuccæ.* Guadalajara, Mexico City (seen in 1892).

BROMELIA PINGUIN.—*Diaspis boisduvalii.* Alta Mira (Tamaulipas).

CALADIUM.—*Pseudococcus yuccæ.* Guadalajara.

CATALPA.—*Ceroplastes mexicanus; Lecanium oleæ, Lecanium* sp. (?); *Pseudococcus yuccæ.* San Luis Potosi.

CHERIMOYA.—*Pseudococcus yuccæ.* San Louis Potosi.

FIG.—*Lecanium oleæ; Pseudococcus yuccæ.* Monterey.

FITOLACA.—*Lecanium hesperidum; Pulvinaria* n. sp.? Monterey.

GUAVA.—*Lecanium hesperidum; Lecanium oleæ.* Nuevo Laredo.

HIBISCUS FLORIDANUS (red-flowering tropical shrub).—*Ceroplastes ceriferus:* Cuautla. *Conchaspis angræci* var. *hibisci:* Tampico.

HYMENOCLEA MONOGYRA (gecota).—*Orthezia sonorensis.* San Ignacio, Sonora.

LANTANA sp.—*Pseudococcus yuccæ.* San Luis Potosi.

MARGUERITA.—*Lecanium oleæ.* Aguas Calientes.

MIMOSA.—*Lecanium imbricatum.* Alta Mira.

OLEANDER.—*Aspidiotus nerii:* Aguas Calientes, Chihuahua. *Lecanium oleæ:* Aguas Calientes.

OLIVE.—*Aspidiotus nerii.* Chihuahua.

ORANGE, LIME, ETC. (citrus fruits).—*Icerya purchasi:* Guaymas, Hermosillo, Magdalena, Victoria, Monterey. *Aspidiotus ficus:* Tampico, Matamoras. *Aspidiotus articulatus:* Tampico. *Aspidiotus scutiformis:* Victoria, Monterey. *Mytilaspis gloveri:* Tampico, Matamoras. *Chionaspis citri:* Tampico. *Orthezia insignis* var.: Aguas Calientes, Guadalajara. *Lecanium hesperidum:* San Luis Potosi, Chihuahua, Tampico. *Pseudococcus yuccæ:* San Luis Potosi, Guadalajara, Tlaltizapan, Tampico.

PALO DULCE.—*Aspidiotus ficus; Aspidiotus nerii.* Chihuahua.

PELARGONIUM.—*Lecanium oleæ; Pseudococcus yuccæ.* Aguas Calientes.

POMEGRANATE.—*Aspidiotus scutiformis:* Monterey. *Pseudococcus yuccæ:* San Luis Potosi.

ROSE.—*Aspidiotus nerii:* Chihuahua. *Aspidiotus* n. sp.?: Monterey. *Aulacaspis rosæ:* Chihuahua. *Lecanium hesperidum:* Nuevo Laredo.

TECOMA STANS.—*Ceroplastes* n. sp.? Guaymas.

TRUENO (lilac-like shrub).—*Aspidiotus nerii:* Aguas Calientes, San Luis Potosi. *Aspidiotus nigropunctatus:* San Luis Potosi.

YUCCA FILIFERA, AUSTRALIS, AND OTHER SPECIES.—*Pseudococcus yuccæ:* Mexico City, Guadalajara. *Aspidiotus yuccæ:* Ciudad Porfirio Diaz. *Aspidiotus nerii:* Guadalajara. *Dactylopius olivaceus:* Ciudad Porfirio Diaz.

UNKNOWN PLANT.—*Eriococcus dubius.* Valles (Tamaulipas).

PREVIOUS RECORDS OF SCALES INFESTING PLANTS IN MEXICO.

The following are previous records of host plants of scales in Mexico, and complete what is known on this subject up to the present time. I am indebted to Mr. Cockerell for these data:

Aspidiotus articulatus. On rose, Vera Cruz.
Aspidiotus ficus. On rose, Vera Cruz.
Aspidiotus scutiformis. On tree resembling avocado pear. Soledad (Vera Cruz).
Lichtensia lutea. On Croton, Vera Cruz.
Lecanium hesperidum. On rose, Vera Cruz.
Lecanium terminaliæ. On liliaceous plant, Vera Cruz.
Ceroplastes irregularis. On Atriplex, Montezuma (Chihuahua).
Ceroplastodes niveus. On spiny shrub, Montezuma.
Mytilaspis philococcus. On cactus, Guanajuato. (Not a *Mytilaspis* s. str.)
Coccus tomentosus. On cactus, Guanajuato, Silao.
Coccus cacti. On cactus.
Icerya palmeri. On grape, Guaymas.
Llaveia axinus. On Jatropha and Spondias, Tlacotalpan (Vera Cruz State).
Capulinia sallei. On "capulino."
Dactylopius citri. On coffee, State of Michoacan.[1]
Lecanium schini. On *Schinus molle.*
Ceroplastes psidii *subsp.* cistudiformis. On Bignonia and Chrysanthemum, Guanajuato.
Ceroplastes ceriferus. On Malva viscus, Guanajuato.
Tachardia mexicana. On Mimosa, Tampico.
Aspidiotus mimosæ. On Mimosa, Tampico.

IMPORTANT ENEMIES OF SCALE INSECTS FOUND IN MEXICO.

The following are native parasites and predatory species collected in Mexico by the writer with the foregoing 25 species of coccids. They number 27 species:

1. *Perissopterus mexicanus* How.—Bred from *Lecanium hesperidum* on lime, San Luis Potosi. From *Pseudococcus yuccæ* on Agave, Guadalajara.

2. *Aphelinus diaspidis* How.—A yellow parasite bred from *Aspidiotus nerii* on trueno. San Luis Potosi.

3. *Coccophagus mexicanus* How.—Bred from *Lecanium hesperidum* on orange, Chihuahua. *Aleyrodes corni* (?) on lime, San Luis Potosi.

4. *Coccophagus flavoscutellum* Ashm.—Bred from *Lecanium* sp. (?) on Mimosa. Alta Mira (Tamaulipas).

5. New genus of *Encyrtinæ.*—Bred from *Pseudococcus yuccæ* on fig. Monterey.

6. New genus of *Encyrtinæ.*—Bred from *Lecanium oleæ* on fig. Monterey.

7. *Encyrtus* n. sp.—Bred from *Pseudococcus yuccæ* on Pelargonium. Aguas Calientes.

[1] In the November 8, 1884, number of El Progreso de Mexico there is a long article by Dr. Jose C. Segura on the coffee scale, there identified as *Dactylopius destructor* (=*D. citri*). The localities given are Orizaba, Cordova, Uruapan, Ario, Cuicatlan, Jacona, Tacambaro, and doubtfully Coatepec (near Jalapa). It is said to be worse in the cafetals of Orizaba and Uruapan.—C. H. T. T.

8. *Signiphora* sp.—A black parasite bred from *Aspidiotus nerii* on trueno. San Luis Potosi.

9. *Eupelmus* sp. ?—Bred from *Lecanium oleæ* on oleander. Aguas Calientes.

10. *Habrolepis* n. sp.—Bred from *Aspidiotus* n. sp.? (related to *A. perseæ* and *A. fodiens*) on orange. Monterey.

11. *Homalotylus* n. sp.—Bred from *Pseudococcus yuccæ* on Agave, Guadalajara. This genus is known to be parasitic only on coccinellids, which must have been among the *Pseudococcus*. It is therefore an injurious species.

12. *Pachyneuron* sp. ?—From *Pseudococcus yuccæ* on pomegranate, San Luis Potosi. From *Pseudococcus yuccæ* on Agave, Guadalajara.

13. *Pachyneuron* sp. ?—Bred from *Acanthococcus* n. sp.? on unknown shrub at Valles (Tamaulipas).

14. *Tribolium confusum* Duv.—From *Acanthococcus* n. sp.? Valles.

15. *Vedalia sieboldii* Muls. var.—This species was found among the waxy egg masses of *Icerya purchasi* which I collected in Magdalena, Sonora. It is a small beetle 3 mm. long, black and red in color; all red below and black above, with two large reddish spots on each elytron, one marginal and the other discal. According to Mr. Schwarz, it is a true Vedalia, whereas *V. cardinalis* (the Australian importation) is not a true Vedalia; Mr. Schwarz thinks there is no reason why *V. sieboldii* should not flourish north of Mexico in the Sonoran belt, and its importation into California might be of much benefit. Unfortunately, it was not found in the egg masses until after my return from Sonora, and it was not met with elsewhere on the trip.

16. *Ozya orbigera* Muls.—This is a bluish coccinellid, considerably smaller than Chilocorus. It was found plentifully in Monterey preying on coccids. The large white cottony-covered larvæ of this species were found with *Lecanium hesperidum* on leaves, branches, and trunk of large trees called "fitolaca," in Monterey. Many adults also occurred on same trees. The larvæ are covered with an abundance of cottony-white excretion, with filamentous processes, and strongly resemble specimens of *Icerya ægyptiaca*. Larvæ numerous, October 17.

17. *Scymnus* n. sp. near *americanus* Muls.—Feeding on *Chionaspis citri* on orange. Tampico.

18. *Scymnus* n. sp. near *auritulus*.—Feeding on *Acanthococcus* n. sp.? Valles (Tamaulipas).

19. *Scymnus* sp. ?—Larvæ feeding on *Lecanium oleæ* on orange. San Luis Potosi. A pteromalid, doubtfully belonging to the genus *Arthrolytus*, was bred from one of these scymnid larvæ.

20. *Chilocorus cacti* L.—Preying on *Pseudococcus yuccæ* on agave, etc., Guadalajara; on *Icerya purchasi* on orange, in Monterey. Found in most places devouring coccids.

21. *Tabanus punctifer* O. S.—An interesting observation was made in Magdalena, Sonora. On the white masses of *Icerya purchasi* on orange there were found numerous specimens of *T. punctifer*, all males, busily engaged apparently in piercing the Iceryæ and sucking their juices. I do not know that any similar observation has ever been recorded. There was also among them a single male of another, smaller species of Tabanus (presumably this genus), but it escaped capture.

It is not unlikely that the males of several species of Tabanidæ may prove of much good in destroying Icerya and kindred coccids. *T. punctifer* is found throughout the southwestern region, and it will be interesting to know if the male has the same habit in California.

22. *Leucopis bellula* Willist.—Bred from *Eriococcus dubius* Valles (State of Tamaulipas).

23. *Phora cocciphila* Coq.—Specimens of a fly of the family Phoridæ were bred from *Icerya purchasi* collected on orange both from Monterey and Victoria. It is probably a true parasite, though this can not be said positively.

24. *Dakruma coccidivora* Comst.?—Larvæ feeding on *Acanthococcus* n. sp.? on unknown plant. Valles (Tamaulipas).

25. *Chrysopa* sp.—Victoria, October 16. Larva found preying on *Icerya purchasi* on orange.

26. *Chrysopa* sp.?—Monterey, October 17. Attacking *Icerya purchasi.*

27. *Psocus* sp.?—Found eating *Aspidiotus* n. sp.? (related to *A. perseæ* and *A. fodiens*) on orange. Victoria, October 16.

NOTE.—At Guaymas and Hermosillo, in Sonora, *Vedalia cardinalis* is well known by reputation. I am informed that Don Luis Torres, governor of Sonora, brought the Vedalia to Hermosillo from Los Angeles, Cal., in 1893. Specimens were taken in June, 1894, to Aranjuez, near Guaymas, and placed on the five or six Icerya-infested orange trees on that place. They seem to have done their work well at Aranjuez, for all the Iceryas I found there seemed to be dead and empty. They ought now to be well distributed by the authorities in Magdalena (where there are many thriving colonies of Icerya), and in Victoria and Monterey.

INJURIOUS INSECTS OTHER THAN COCCIDS.

Material was collected on the trip that does not appear below, as only species of economic importance are mentioned.

1. *Aleyrodes corni* Hald.?—Specimens of this species were found on leaves of orange in Guadalajara; and on orange, lime, and Catalpa leaves in San Luis Potosi.

2. *Aleyrodes* sp.?—On leaves of orange, Tampico.

3. *Aleyrodes* sp.?—On leaves of *Tecoma stans,* Guaymas.

4. *Aphides.*—Plant lice often occur on orange in Sonora and other parts of Mexico. They were mentioned as injurious in Guaymas in summer months.

5. *Cicada* sp.—Apple twigs at Magdalena, Sonora, showed unmistakable signs of having been largely oviposited in by a *Cicada.* The same was observed in twigs of deciduous fruit trees at San Ignacio.

6. *Œcanthus niveus* Serv.—Found at San Ignacio, Sonora, September 26, on tobacco. Reported to have caused much injury in August (1894) by eating holes in the tobacco leaves in this district.

7. *Papilio cresphontes* Cram. (?) (orange dog).—An orange dog, the larva probably of this *Papilio,* was found on orange, eating the leaves, in Guadalajara. It was also found on orange in Victoria and Monterey.

8. *Thyridopteryx* sp.?—A bagworm, apparently of this genus, is very bad on orange in parts of Mexico. It was found on orange at Guaymas, where I was told it caused much injury in midsummer. It also occurs on the orange trees in Hermosillo. It was found in large numbers on the orange trees in Guadalajara, and was also found on orange in Tampico.

9. *Ligyrus ruginasus* Lec.—Great numbers of these beetles were observed attracted to light at night at Magdalena, September 26. Also at Nogales (on border). These immense numbers indicate much injury, in case they breed in roots of any crop. It is possible the larvæ breed in *Helianthus,* though it is very likely that they infest roots of sugar-cane which is grown in the Magdalena region.

10. *Oncideres putator* Thom.—This grayish species was found girdling branches of Acacia, near Chocoy (State of Tamaulipas), October 15. It is not improbable that it may attack fruit trees also.

11. *Trypeta ludens* Lw.? (orange worm or maggot).—The oranges which come from the State of Morelos to Mexico City are badly infested with maggots. These are with little doubt the larvæ of this fly, which is fully treated of in Insect Life (vol. I, p. 45). These wormy oranges come principally from Yautepec. So far this orange maggot does not seem to have spread to the other orange regions of Mexico.

NOTE.—*Succinea brevis* Dkr. and *Praticolella griseola* Pfr.—These two species of snails were found on branches and trunks of orange trees in Tampico. The several specimens of *S. brevis* had all been infested with a sarcophagid fly, belonging to the genus *Sarcophilodes.*

Enemies of stored vegetable products.—An effort was made to obtain specimens of certain enemies of grain and other stored products in Mexico. Several species belonging to the Ptinidæ, Bruchidæ, Rhynchophora, and Lepidoptera, are of much economic importance from the injury they would do if introduced into the United States.

A number of species were obtained in stored corn, etc.[1]

EXTENT OF CLIMATIC AND FRUIT REGIONS.

In the region of the western coast of Mexico the warmer belt adapted to the subtropical fruits extends much farther north than it does in the eastern coast region at the same elevation above the sea.

Date palms grow luxuriantly at Guaymas and Hermosillo, and even as far north as Magdalena in Sonora. They can not do well in Chihuahua, which is nearly as far south as Guaymas, nor even in Aguas Calientes, which is well within the tropics. The latter place, though only about 6,000 feet above the sea, has been known to receive snow falls. Magdalena, in Sonora, though but little south of 31° N., is nearly the same temperature as (or warmer than) Monterey, which is about the same distance south of 26° N., and both places are at nearly the same elevation. This represents a difference of 300 miles in a north and south line. Date palms grow well at Matamoras, however, which is near the coast and much farther south than the Sonora date-producing region.

Oranges grow and produce exceedingly well at Guaymas (San Jose de Guaymas) and Hermosillo. They also seem to do fairly well at Magdalena, though there are very few at that place. There are more at San Ignacio, a small town about six miles north of Magdalena on the railroad. The Hermosillo oranges have the reputation of being among the finest in the world. In Chihuahua (neighborhood of city) oranges cannot be raised, the winter frosts being too severe. A few trees are to be found in the city, but only in sheltered patios (interior courts of houses), and none in any of the plazas. A very few oranges are raised at Aguas Calientes. At Monterey some few are raised, and south toward Victoria there is quite an extensive orange-producing region, notably at Montemorelos and Linares, particularly the former. Oranges, and especially limes, are raised at Victoria, and all the region between that place and Tampico would form a splendid district for the production of citrus fruits if a sufficient water supply could be secured. In the Guadalajara region a good many oranges are raised in the barrancas (deep ravines) to the west, but they are extensively produced in the Lake Chapala region south of La Barca, which is less than halfway between Guadalajara and Irapuato, on the main line of the Mexican Central Railroad. Then again, in the State of Morelos, south of the City of Mexico, in the low valleys or hot lands, oranges are raised prin-

[1] These are reported upon by Mr. Chittenden in a following article.—L. O. H.

cipally at Yautepec. In the State of Vera Cruz there is an extensive, well-known orange region in the vicinity of Orizaba and Cordova, as well as farther south. Oranges are also grown to a limited extent in east central Coahuila, and do very well at Matamoras.

Bananas grow outside at Guaymas on the west, and Victoria to Matamoras on the east. They grow only in sheltered patios at Monterey. Plantains, however, are grown outside in towns of northeastern Coahuila, where the frost kills the tops in the winter, but does not injure the roots. Bananas grow and fruit in the barrancas to the west of Guadalajara, between Yautepec and Jojutla in Morelos, and in the Orizaba and Cordova region. They do not grow or fruit on the table-lands.

Cocoanut palms can grow and survive at Guaymas, as Mr. Graf has demonstrated, while Tampico is close to the northern limit for them on the Gulf of Mexico coast.

Sugar cane is grown in southern Sonora (in the Hermosillo region), and some is grown near Magdalena. To the east it is grown from eastern Coahuila to Matamoras. It is extensively raised farther south, in the States of Morelos, Vera Cruz, etc.

Cotton is raised near Santa Rosa, in southern Sonora; near Santa Rosalia and Jimenez, in southern Chihuahua; very largely in what is known as the Laguna district, comprising the region around Lerdo and Torreon, being in northeastern Durango and southwestern Coahuila. Another cotton section of considerable importance is that in northeastern Coahuila, along the International Railroad, between Monclova on the south and Ciudad Porfirio Diaz on the border. Cotton is also raised around Matamoras, and the cotton belt extends into northern Texas.

Corn, beans, etc., are raised more or less all over Mexico. Wheat is largely raised in the Magdalena (Sonora) region, and northeastern Coahuila is well adapted to wheat raising.

Pomegranates are extensively raised in the Magdalena region, especially at San Ignacio, etc.; also some at Hermosillo and Guaymas. They also grow at Monterey, San Luis Potosi, and Matamoras.

Olives grow well at Hermosillo. The olive is grown as a tree in plazas in Chihuahua, but probably does not fruit.

Grapes produce but little in Guaymas, Hermosillo, and Magdalena. Some 20 miles to the west of Chihuahua City there are fruit ranches where considerable quantities of grapes are raised. Some are raised also at Santa Rosalia.

Peaches and pears grow well in the Magdalena (Sonora) region, along the railroad from Cerro Blanco (or Imuris) on the north to Santa Ana on the south. Peaches bear especially well at San Ignacio. They do not seem to do well as far south as Hermosillo. At the ranches west of Chihuahua City they are quite extensively produced. Plums and apricots also do well at Magdalena. Peaches are grown at Santa Rosa-

lia and at Saltillo; also somewhat at Monterey. Apples do not do particularly well in Sonora, the few trees in the Magdalena region failing to yield profitably. Some apples are raised at Saltillo and Monterey, but they are the small Mexican variety. Some few peaches and small apples are also raised in northeastern Coahuila. Peaches, plums, and grapes are said to do well from Nuevo Laredo to Matamoras.

Figs grow luxuriantly at San Ignacio (Sonora), at Monterey, and in towns of northeastern Coahuila.

Quinces are largely grown at San Ignacio and other points in the vicinity of Magdalena, and yield well.

PARTICULARS AS TO PRESENT SHIPPING OF FRUITS, ETC., BY RAIL.

Oranges are shipped from Guaymas and Hermosillo, in Sonora. Those shipped from Guaymas are brought to the railroad at Batamotal, which is a station about seven miles north of Guaymas by rail. These Sonora oranges go to Chicago and other eastern points chiefly, but I was also informed by officials of the Sonora Railway that some are shipped to California, going to the San Francisco market. My investigations in Sonora did not reveal any other scale on orange beside *Icerya purchasi*, and that was long ago established in California, whence it probably spread into Sonora. *Icerya palmeri* was found near Guaymas on grape, but I was unable to find any sign of it on grape or other plant anywhere in Sonora or elsewhere. If it should spread, there would then be danger from these shipments of Sonora oranges of its reaching California, though it probably is so closely related to *I. purchasi* (the young only being known) that I think the prediction is safe that it would practically amount only to a new installment of that species.

In the vicinity of Aguas Calientes, which is on the Mexican Central Railway, a very few oranges are raised. These are shipped only as far as Zacatecas.

On the branch of the International Railway, which runs from Mexico City south into the State of Morelos, oranges are raised in considerable quantity at Yautepec. They are shipped only as far as Mexico City. These Morelos oranges are badly infested with the larvæ of a fly (*Trypeta ludens*). I was informed in Mexico City that it was rare to find an orange entirely free from these maggots. Oranges appearing perfectly sound on the outside prove wormy upon being opened, so that it is impossible to tell infested fruit from its outward appearance. A very few oranges are also raised at Tlalcotapan, Jojutla, and other Indian towns in Morelos on the railway. None of them, however, are shipped farther than Mexico City.

Oranges from the Guadalajara region are shipped principally at La Barca. From Guadalajara itself only about 15 or 20 carloads are shipped yearly. These come from the barrancas to the west, the nearest orange groves being from 20 to 25 leagues from Guadalajara. The groves at La Barca are something like three leagues from the rail-

road. Many carloads have been shipped yearly from La Barca for a period of many years. This is where the largest shipments of Mexican oranges come from, and they are nearly all sent through (in carloads) to Kansas City.

In the State of Tamaulipas, oranges are shipped largely from Montemorelos, and also largely though in less quantity from Linares, both on the Monterey and Gulf Railway, between Monterey and Victoria. These also are all shipped to Kansas City, and doubtless go over the National Railway via Laredo and San Antonio. Some few are shipped from Victoria. Very few oranges are raised at Tampico, and therefore none shipped.

The Cordova and adjacent orange regions do not ship fruit out of the Republic. It is consumed mostly between Mexico City and Vera Cruz. An occasional tourist may, however, bring oranges from that region to the States.

Limes are raised at Guaymas, but none or very few are shipped, though I should think it would pay well to ship them. They are produced in great quantity in Tamaulipas, notably at Victoria, and their shipment would, I believe, be profitable. It is because such shipments may be made in the near future that these points are mentioned.

Peaches, pears, and quinces are shipped in some quantity from the Magdalena (Sonora) district to Arizona points chiefly. No pests, however, were found on these fruits. Pomegranates are shipped from Magdalena and Hermosillo to Arizona points. Watermelons are shipped from Sonora to Arizona points and to Albuquerque and Deming in New Mexico. Wheat, corn, beans, etc., are not shipped, as a rule, but are all consumed in the country. Irish potatoes are usually scarce.

STEAMSHIP LINES AND THEIR BEARING ON THE SUBJECT.

As affecting the dispersion of orange pests, as well as scale insects in general, it should be mentioned that at present West Indian and Pacific Company steamers ply regularly between Tampico and New Orleans, stopping at Progreso on the way. They arrive at Tampico from Kingston, Jamaica, with a stop at Vera Cruz included; and they arrive at Jamaica from Colon. It should be remembered, however, that during all the warmer months these steamers are rigidly quarantined below New Orleans and everything aboard thoroughly subjected to the influence of hot steam or fumigated. It is not likely that the scale insects would survive the treatment to which the New Orleans authorities subject all boats that arrive during the warmer months from so-called yellow fever ports, but scales could easily be brought during the winter months.

Steamers also run from Tampico to Galveston and Mobile, while the Ward Line boats, that run to New York from Tampico, arrive at the latter port via Habana and Vera Cruz.

On the west coast regular steamers ply between all ports and San

Francisco, but these are quarantined and inspected in California by horticultural inspectors, so that not much is to be feared from that quarter. More is to be feared from the Gulf of Mexico coast lines and railway communication.

DANGER FROM WEST INDIAN PORTS.

Our Southern States stand in much danger from West Indian ports, especially from Cuba, which is in close communication with them by steamships and sailing vessels. Sixty-five or more species of scales are known from Jamaica. Seventeen of these occur out of doors in the Southern States, eight more being known in hot-houses there. Only four species of scales are so far recorded from Cuba. Compared with Jamaica, Cuba ought to have 75 or 100 species. Many species have doubtless been brought from Cuba to our Southern States, and others are apt to follow if not guarded against. Frequent boats run from Tampa, Fla., to Key West and Habana, and return by same route. It is only 90 miles across from Key West to Habana. Frequent boats run from Cuba to other ports in the Southern States.

CONDITIONS WHICH RETARD THE SPREAD OF INJURIOUS INSECTS IN MEXICO.

It is a peculiar fact that in Mexico the natural conditions are such as to retard the spread of injurious insects of certain groups; while, on the other hand, artificial conditions that spread insects in our own country are happily such at present as to give little aid to their dispersion in Mexico. I refer, first, to the topography and resultant isolation of climatic regions in Mexico; and second, to the fact that shipments of fruit, etc., by rail are not made from one to the other of these regions These observations apply best to orange insects. The following is a good case in point:

It has already been mentioned that the orange worm (larva of *Trypeta ludens*) infests the oranges to a very great extent in the State of Morelos. It was known in that region many years ago, and does not seem to occur yet in any other orange region. Inquiries were made at Guadalajara, where I was told that wormy oranges were unknown, and I have never known of wormy oranges from the Cordova or Orizaba region, many of which I have examined. Likewise they were not heard of in Tamaulipas or Sonora. The explanation of this is that the Morelos orange region is effectually isolated from others by climatic barriers in the shape of ranges upon ranges of mountains where the orange can not thrive, even were these ranges not in the original wild state, and also that the oranges shipped from the infested localities in the State of Morelos go no farther than Mexico City, where they are all sold and consumed.

The same holds good in several instances of scale insects of the orange. *Orthezia insignis* var. was found only in Guadalajara and

Aguas Calientes. It was very bad at both places. These two localities are connected by deep and long barrancas, which run in a somewhat northeasterly and southwesterly direction a little to the west of both places, and in which oranges are largely raised. Both localities, therefore, belong to the same region. Either this or a similar variety, however, is known from Vera Cruz.

Pseudococcus yuccæ is an exception, as it occurs from Morelos (State) to Guadalajara and Tampico, and is spread well over the plateau region, even extending into California. It is a much hardier insect.

Aspidiotus scutiformis was originally found by Cockerell at Soledad, in the State of Vera Cruz, on leaves of a tree resembling avocado pear somewhat. Doubtless this tree is its native food-plant, or one of them, and this would indicate that the species had taken to orange and spread northward. This it could easily do, as there are no mountain ranges to act as barriers to its spread to the northward. The Gulf Coast region is a low, flat strip of country, from 50 to more than 100 miles in width, between the Gulf and the foothills of the mountains, and running from southern Vera Cruz State to Texas, gradually widening to the northward. Though this species was not met with at Tampico, it must occur in that vicinity, as it was found so abundant at Victoria and as far north as Monterey. It has so far been found only in the foothill regions of the eastern side on the Mexican table-land, in localities between 1,000 and 2,000 feet in elevation. It is very likely to turn up, however, at any time in Tampico and Matamoras.

Icerya purchasi is a more difficult case to explain, being found in Sonora on the west and in Tamaulipas and Nuevo Leon on the east. These two regions are separated not only by a vast tract of high table-land, but by the vast and almost unknown region of the Sierra Madre Mountains, and are totally unconnected by either railways or wagon roads, except in a roundabout way through the United States. It seems impossible that it should have spread from one region to the other, unless by means of cuttings sent from the Sonora region. It is more probable that it spread to the eastern region by cuttings brought from California.

SCALES THAT HAVE BEEN INTRODUCED INTO MEXICO FROM THE UNITED STATES.

Turning now from the importation side of the question and looking at the exportation side, there is little doubt that Mexico has received several noxious species of scale insects from the United States through her steamship communication with the Southern States. *Chionaspis citri*, *Mytilaspis gloveri*, and *Aspidiotus ficus* were found plentifully in Tampico and (except the first) in Brownsville and Matamoras, but not elsewhere, except that the last was found by Cockerell in Vera Cruz. They have doubtless been brought to these ports by steamers from Mobile and New Orleans. *A. ficus* is abundant in Jamaica, and may have been brought

from there, however, or from Cuba. Steamers from both islands stop at Vera Cruz before reaching Tampico, and this would explain the occurrence of *A. ficus* in Vera Cruz.

As to railway introductions, *Icerya purchasi* has probably been brought to Sonora from California in this way. It was most abundant at Magdalena, less so at Hermosillo, and still less at Guaymas. I was informed by Señor U. Ferreira that it first appeared in Hermosillo during the yellow fever epidemic there eleven years ago, in 1882–83. It was first noticed in the plaza. The railway had recently been completed at that time. I do not see how else it could have reached Sonora from California than on orange cuttings. It is found in the interior of Tamaulipas (but not at Tampico), and in Nuevo Leon, and the most probable theory is that it spread to both regions in Mexico directly from California on cuttings.

SCALE INSECTS MOST LIKELY TO BE INTRODUCED INTO THE SOUTHERN UNITED STATES FROM MEXICO, AND MOST TO BE FEARED.

Aspidiotus scutiformis.—This is a very bad species, and is apt to reach the Southern States or California. Its northern limit, as at present known, is Monterey, where it is simply massed upon the leaves of the orange. It would most probably spread by rail, as it does not seem to be found at Tampico. It may be expected at any time in Matamoras and Brownsville (Texas).

Pseudococcus yuccæ.—This is another very bad species, being particularly bad on orange at Guadalajara. It was originally described from California, but there is much danger of its reaching the Southern States from Mexico. It infests a great variety of plants, is a hardy species, and is well spread over Mexico. Therefore it would be extremely apt to adapt itself readily to the Southern States, and should it reach there it would prove a most unwelcome pest. It would probably spread by rail, though there is also a probability of its being carried by boats from Tampico.

Orthezia insignis var.—This would prove, if anything, worse than either of the two preceding. It is very injurious on citrus fruits in the Guadalajara and Aguas Calientes region. It would probably spread by rail. Professor Cockerell informs me that this species has recently been sent him by Dugès from Guanajuato, which proves that it is beginning to spread. If the variety found in Vera Cruz by Cockerell is the same, it is already spread over a wide region in Mexico.

Icerya palmeri.—This species could not be found in Sonora by the writer. If it should spread, it would stand a very good chance of reaching California by rail.

Aspidiotus articulatus.—This was found on orange in Tampico, associated with *A. ficus*. It could easily reach the Southern States by boats.

Several other species, including *Conchaspis angræci* var. *hibisci* found

at Tampico, would doubtless prove very injurious, at least to certain ornamental trees and plants, if introduced. It should also be remembered that *Chionaspis citri*, *Mytilaspis gloveri*, and *Aspidiotus ficus* have not reached California, but may do so through Mexico; just as *Pseudococcus yuccæ*, which occurred in California, may reach the Southern States from Mexico.

DANGER TO MEXICO FROM INTRODUCTIONS FROM OUR COUNTRY.

There are a number of scales of the orange in California that are not yet known in Mexico. These could easily reach the Hermosillo and Guaymas orange districts of Sonora by rail. Sonora, on the whole, probably stands in more danger from us than we do from her.

Again, there are several bad species in our Southern States that have not yet reached Mexico, and which could easily do so on board steamers plying between New Orleans, Mobile, and Mexican ports.

NATURAL ENEMIES OF SCALE INSECTS IN MEXICO DESIRABLE TO COLONIZE IN THE UNITED STATES.

Among the Coleoptera, it would be very desirable to introduce *Vedalia sieboldii* var., *Ozya orbigera*, and the species of *Scymnus* mentioned; nearly all of the parasitic hymenoptera (except *Homalotylus*)—about 14 species mentioned, of which probably but few occur within our limits—and the *Phora cocciphila* bred from *Icerya* from Monterey and Victoria.

AGENCIES NOT GENERALLY RECOGNIZED IN THE DISPERSION OF SCALE INSECTS.

Tourists who visit Mexico often bring away with them specimens of live plants, etc. In this way they may play a greater part in the dispersion of scale insects than do fruit shippers. Much is to be feared from this source, which is doubtless responsible for many introductions. It is more often practiced on steamers than on railroads. On the steamers which ply between different islands in the West Indies there are almost always to be seen potted and other plants which passengers are taking home with them from some other island. In this way it is believed by Professor Cockerell that many of the noxious scales found throughout the West Indies have been spread from one island to another.

PORTS AND POINTS ON THE BORDER MOST TO BE GUARDED.

The Pacific ports of Mexico are supposed to be well guarded against by the horticultural inspectors in California, as already mentioned. The ports of our Southern States are open, at least during the colder season, to importations of injurious scales from the Gulf ports of Mexico and the West Indies. Inspection should be instituted of all plants, fruits,

roots, seeds, grains, and other vegetable products reaching these ports—Galveston, Corpus Christi, New Orleans, Mobile, Tampa, Key West, and Brazos (port of Brownsville).

Border points between the United States and Mexico where most is to be feared are those situated on the railroads. They are five in number: Nogales (in Sonora and Arizona), Ciudad Juarez (opposite El Paso, Tex.), Ciudad Porfirio Diaz (opposite Eagle Pass, Tex.), Nuevo Laredo (opposite Laredo, Tex.), and Matamoras (opposite Brownsville, Tex.). These are, respectively, on the Santa Fe (or Sonora) Railway, the Mexican Central, the Mexican International, the Mexican National, and the Matamoras and Monterey, along the Mexican side of the lower Rio Grande, bought by the Mexican National Railway Company to prevent (or delay as long as possible) its completion. This last-named line runs from Matamoras to San Miguel, connecting there with stage for Monterey; at the other end it connects with a short line, the Rio Grande Railway, running from Brownsville to Point Isabel (across the bay from Brazos de Santiago), on the Texas coast.

All plants, fruits, stored grain, roots, and vegetable products of any description coming from Mexico should be inspected before they are allowed to cross the border into the United States. In all cases especially careful inspection should be made of living plants or roots, potted or otherwise, when such occur.

INSECTS AFFECTING STORED CEREAL AND OTHER PRODUCTS IN MEXICO.

By F. H. Chittenden.

The warm, equable climate of Mexico, particularly of its tropical portions, where insects breed continuously the year round, is particularly adapted to the existence of such species as subsist on grain and other edible products that are kept in store, a fact that was brought prominently to view by the collections of the writer in the exhibits of that country displayed at the World's Columbian Exposition.

Toward the close of Mr. Townsend's tour of investigation in Mexico he was requested by Mr. Howard to collect such insects as might be found in stored cereal and other edible seeds and similar products, but owing to the then limited time at Mr. Townsend's disposal and the further fact that only a few localities were visited nothing new or especially interesting was taken, all the species reared from samples of his collecting being common and of cosmopolitan distribution.

The grain and seed display of Mexico was one of the largest on the Exposition grounds, and as the numerous samples came from many parts of that country an exceptionally fine opportunity was afforded for the collection of the native and injurious forms.

A greater number of insects were present in these exhibits than from any other country, and all of the really dangerous species were found in them (see author's report, Insect Life, vol. VI, p. 225). Several of these insects are unknown or of limited distribution in the United States, and it seems fitting that a list of such as infest stored edible products be brought together as a supplement to the lists of other Mexican insects prepared by Mr. Townsend. I have included a few data gathered from collections at the Atlanta Exposition of 1895, and have added brief notes on their food habits, injuriousness, and distribution, and have indicated the species whose introduction into our storehouses are especially to be guarded against.

The cosmopolitan species of wide distribution in the United States are marked with a star (*).

LIST OF MEXICAN INSECTS THAT AFFECT STORED PRODUCTS.

* *Silvanus surinamensis* Linn. (saw-toothed grain beetle).—A common cosmopolitan and widely distributed species, found in various Mexican exhibits at the Columbian Exposition by the writer and in shelled corn sent to this office by Mr. Townsend. It is injurious to a great variety of cereal and other seeds, dried fruits, and many other substances.

Silvanus sp.—An undetermined species found in yams and edible tubers in the Mexican exhibit at the Exposition.

* *Cathartus advena* Waltl.—Also taken at the Exposition. A widely distributed general feeder like *S. surinamensis*, but not so common or injurious.

Pharaxonotha kirschi Reit.—This species was originally described from Mexico, and was found in the Mexican and Guatemalan exhibits of the Exposition, infesting corn meal and edible tubers. Sufficient material was secured for rearing and other experiment, and my experience with this insect indicates its ability to hold its own with the other tropical species that have already been introduced here. Its occurrence has been noted in Brazil, where it may be native, as well as in tropical Central America.

Until December of 1895, when Mr. E. A. Schwarz captured a single individual of this insect in the vicinity of San Antonio, Tex., it had never been taken in this country. It was found under dried leaves remote from human habitation. Although this shows that the species occurs within our faunal limits, it was probably imported across the Mexican border, and there is still danger of its introduction into storehouses through commerce with Mexico, and especially since it is not confined for food either to meal or tubers.

Litargus sp.—A mycetophagid closely allied to our native *L. balteatus* Lec., breeding in abundance in potatoes, yams, and other edible tubers at the World's Fair. None of the species of this genus are known to be injurious, and it is probably only a scavenger.

* *Tenebroides mauritanicus* Linn. (cadelle).—A common species of omnivorous habits, but chiefly injurious to cereals; probably indigenous to tropical America, but long ago diffused by commerce over nearly the entire globe.

* *Carpophilus hemipterus* Linn.—An enemy of stored fruits. Recorded by Dr. Sharp from Cordova and Jalapa.

Carpophilus pallipennis Say (corn sap-beetle).—Collected by Dr. Edw. Palmer and the late H. K. Morrison in Mexico. Sometimes injurious to stored corn in our Southern States.

* *Carpophilus dimidiatus* Fab.—Taken in numbers in corn meal at the Columbian Exposition by the writer. Widely distributed in Mexico. Lives in cotton bolls and in ripening or overripe fruit in the South.

* *Dermestes vulpinus* Fab. (leather beetle).—Living on hides and dried fish in the Mexican exhibit at the Exposition. Also in the National Museum from another source in Mexico.

Dermestes carnivorus Fab. (*mucoreus* Lec.).—Of similar habits to the preceding, and said to injure bacon and hams after the manner of that species. Recorded from Mexico and from Texas. Nearly cosmopolitan.

* *Necrobia ruficollis* Fab. (red-necked ham beetle).—Recorded from Guanajuato by Gorham. Taken on dried fish at the Exposition.

* *Necrobia rufipes* Fab. (red-legged ham beetle).—Recorded from several localities in Mexico by Gorham. Taken with the above. Also infesting cheese.

Dinoderus truncatus Horn.—This species was first recorded by the writer from Mexico (Insect Life, vol. VII, p. 327) from specimens found infesting corn and edible tubers at the Columbian Exposition. It was found in corn in the Mexican exhibit at the New Orleans Exposition; also in samples of Mexican seed corn in the Botanical Division of this Department. This is an aggressive species and will bear close watching. It is able to subsist on almost any sort of roots and tubers, and would create great havoc should it become introduced into our granaries, as the adult has a habit of leaving the grain in which it has bred and boring into woodwork or anything else that obstructs its path. I have known it to bore into both pine and hard black walnut. Described from California from mutilated material, probably of accidental occurrence as the species has not been recorded from there since.

Dinoderus pusillus Fab.—Recorded from Mexico by Rev. H. S. Gorham, who states that it is "common in wood of sugar casks." It also injures grain. At the Columbian Exposition it occurred in two exhibits from Mexico.

* *Sitodrepa panicea* Linn. (drug-store beetle).—A well-known cosmopolitan species, injurious to cereals and other seeds, drugs, tobacco and other dried plants, and a great variety of dried substances. Recorded from Cordova and Pueblo by Gorham.

* *Lasioderma serricorne* Fab. (*testaceum* Dufts.) (cigarette beetle).—Mentioned by Gorham from Vera Cruz. Of very similar habits to the above, but not so common, and chiefly injurious to tobacco and drugs.

* *Tribolium ferrugineum* Fab. (rust-red flour beetle).—An important enemy of stored cereal and other products, of wide distribution. In the Mexican exhibit at the World's Fair; also recorded from there.

* *Tribolium confusum* Duv. (confused flour beetle).—Mentioned by Dr. Champion as occurring in Mexico, and collected by Mr. Townsend. Of similar habits to the preceding.

* *Echocerus maxillosus* Fab. (slender-horned flour beetle).—This species is probably native to South America and perhaps also to Mexico. Common in our Southern States under bark and in cornfields as well as in the granary.

* *Echocerus* (*Gnathocerus*) *cornutus* Fab. (broad-horned flour beetle).—Champion states that this species has been introduced in Mexico. I am, however, inclined to consider it as not generically distinct from *Echocerus*, and hence, with other species of the genus, as indigenous to the New World. Although cosmopolitan, it is still of limited distribution in the United States, being comparatively unknown outside of California and in the neighborhood of the Atlantic seaboard.

Sitophagus hololeptoides Lap.—This species is related to the preceding and is known to have been found in flour. It is undoubtedly indigenous in Mexico, but is unknown in the United States. As it is probable that it occurs like other allied forms chiefly under bark, its introduction with us would not positively prove disastrous.

Palorus subdepressus Woll.—The flour beetle mentioned by Champion under the name of *Palorus melinus* Hbst. (Biol. Centr. Amer., Col. vol. IV, pt. 1, p. 174) as having been collected by Dr. Edw. Palmer, of this Department, at Minas Viejas, has since been determined by the same writer as the above-mentioned species. It occurs in granaries in Europe and elsewhere, also under bark. In our Southern States it has been found, but only under bark.

* *Tenebrio obscurus* Fab.—Reared from a larva collected in Mexico by Dr. Palmer. The larvæ of this species and *T. molitor* are the familiar "meal-worms" and have probably both been introduced into Mexico as food for song birds.

* *Alphitobius diaperinus* Panz.[1]—Mentioned as occurring in Mexico by Champion. Habits similar to the meal-worms, with which it often occurs. Widely distributed.

* *Alphitobius piceus* Ol.—Also recorded by Champion, who states that he found it (at Panama) "amongst old bones thrown out from the slaughterhouses." Cosmopolitan, but practically limited to the South in the United States.

* *Bruchus obtectus* Say (common bean weevil).—In the greatest abundance in the Mexican exhibit at the Exposition, and sent also by Mr. Townsend. A well-known enemy to beans almost everywhere.

* *Bruchus 4-maculatus* Fab. (four-spotted bean weevil).—A common species in our Southern States and said by Sharp to occur in Mexico.

* *Bruchus* (*chinensis* Linn.) *scutellaris* Fab. (cowpea weevil).—Also recorded by Sharp from Mexico.

Spermophagus pectoralis Shp.—This species, as I have already pointed out (Insect Life, vol. VII, p. 328), breeds like our common *Bruchus obtectus* in stored beans, and as it is congeneric with other species belonging to our United States fauna its introduction into this country in beans should be avoided. It was originally described from Central America and was breeding at the Exposition in beans from Brazil, as well as from Mexico and Guatemala.

* *Calandra granaria* Linn. (granary weevil).—In grain and chick-peas collected by the writer at the Exposition and by Mr. Townsend in Mexico.

* *Calandra oryza* Linn. (rice weevil).—This species attacks all sorts of cereals and is as well distributed and injurious probably as any known insect. It was present in injurious numbers in nearly every grain exhibit at the Columbian Exposition, and has been sent us by Mr. Townsend and others from different parts of Mexico.

Caulophilus latinasus Say.—This little cossonine weevil, which bears some slight

resemblance to the two preceding species, was received at this office in December, 1895, from the Atlanta Exposition, where it was found in Indian corn and chick-peas (*Cicer arietinum*) in the Mexican exhibit. So far as we know, this is the first instance of its occurrence in either stored grain or legumes, although there is one record, by Mr. Townsend, of its having been found in dried ginger in Jamaica (Institute of Jamaica, Notes from the Museum, No. 78). Occurs in Florida and South Carolina, but does not seem to be known with us as a storehouse pest.

Araecerus[1] *fasciculatus* DeG. (coffee-bean weevil).—A series of this anthribid beetle was collected by Dr. Palmer at Acapulco. It is disposed to omnivorousness, being known to breed in raw coffee berries, cacao beans, mace, nutmegs, cotton bolls, the seed pods of the coffee weed (*Cassia* sp.), and a plant called wild indigo, probably a species of *Indigofera*. This insect is already well known throughout the cotton States, and beetles are sometimes found in the Northern States in articles of commerce.

Cryphalus jalappæ Letz.—This little scolytid borer is probably indigenous to Mexico, but is often imported into other countries with commercial jalap, upon which it lives. Its presence is not considered detrimental to the drug.

* *Sitotroga* (*Gelechia*) *cerealella* Ol. (Angoumois grain moth).—This species is a powerful rival of the two Calandras as a granary pest. Like them, it thrives on cereals of all kinds and is nearly as well distributed. At the Columbian and Atlanta Expositions, and collected by Mr. Townsend and others.

Ephestia kuehniella (Mediterranean flour moth).—This scourge of the flour mill was breeding in a large exhibition case from Mexico at the Exposition, but the colony was promptly destroyed and the introduction of the species at Chicago thereby prevented. It has obtained a footing in several portions of the United States, being particularly destructive on the Pacific Coast, but in the East and the South it is still very limited in its distribution, and its introduction through Mexico into Texas and other Southern States is more to be dreaded than that of any other storehouse insect.

* *Plodia interpunctella* Hbn. (Indian-meal moth).—A wide-spread species, of omnivorous habit. In grain and dried fruits from Mexico both in the agricultural and horticultural buildings at the World's Fair. It was reared from cacao beans from Mexico, and from edible acorns collected in Chihuahua by Mr. Townsend.

* *Tinea biselliella* Hum. (clothes moth).—A series of this moth has been received from Dr. E. Dugès, Guanajuato, Mexico, with the statement that the insect does much damage to stored corn. The species has in this instance, perhaps, been confounded with *Sitotroga cerealella*, although I have myself reared it from stored wheat infested with the latter insect.

Carphoxera ptelearia Riley (herbarium geometer).—This pernicious herbarium pest was described from material first found infesting dried plants received at this Department from Mexico and Lower California, and it is more than probable that these insects were introduced from that country.

* *Piophila casei* Linn. (cheese skipper).—At the Columbian Exposition in cheese; also injures ham.

Atropos sp.—In the Mexican exhibit at the World's Fair.

Gamasus spp.—Two undetermined mites of this genus, with the preceding in corn.

In addition to the above, a few other species not positively known to occur in Mexico should receive at least passing mention here, as there can be little doubt, from what is known of their distribution, that they occur in that country. These are: *Cathartus gemellatus*, the "red grain beetle" of our Southern States; *Ephestia elutella*, or chocolate moth; *Anthrenus verbasci* (*varius*), a common museum pest; *Trogoderma sternale* Jayne, a species of somewhat similar habits to the preceding one; *Calandra linearis*, the tamarind-seed weevil; *Alphitophagus bifasciatus*, a cosmopolitan species often found in storehouses.

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[1] *Araecerus* is the original spelling of this genus (Schoenherr's Curc. Disp. Meth., p. 10; Gen. et Sp. Curc., vol. i, p. 173), hence must take precedence over *Arœocerus*.

[2] During April, while this bulletin was going through the press, the discovery of the flour moth was announced in a mill near Saltillo, Mexico.

NOTES AND DESCRIPTIONS OF THE NEW COCCIDÆ COLLECTED IN MEXICO BY PROF. C. H. T. TOWNSEND.

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ASPIDIOTUS.

The two following new species are both nearctic, not neotropical, types.

Aspidiotus nigropunctatus n. sp.

Female scale.—Subcircular to suboval, 3 mm. in diameter, only slightly convex, crowded together on bark. Color of scale dirty gray. Exuviæ sublateral, pitch-black, with a narrow reddish margin. Exuviæ covered by an easily deciduous film of white secretion. Removed from the bark, the scales leave a conspicuous white mark. Immature scales are rather brownish.

Adult female.—Orange brown, oval. Mouth-parts large. Five groups of ventral glands, cephalolaterals 16 (sometimes more), caudolaterals 10 or 11; median group with 7 or 8 orifices. Anal orifice elongate in form, somewhat posterior to level of caudolateral groups of glands. Four pairs of lobes, these blunt and subtruncate, broad but not very broad, and flattened as in *mimosæ*; median lobes close together but not touching, their proximal sides parallel, their ends squared though rather irregular or subcrenate; second and third lobes distinctly notched; fourth rather low and rounded, with a smaller detached portion cephalad. Cephalad of this, the margin presents three small lobules. Plates not conspicuous, scale-like, short. Between the lobes are saccular incisions, such as are seen in *mimosæ*, etc. These are as follows: A short one at inner base of each median lobe; a large one, followed by a small one, between first and second lobes; a large one, with a small one on each side of it, between the second and third lobes; three rather small ones between the third and fourth lobes. The oval (dorsal) pores are as follows: One beneath each median lobe; four or five beneath (cephalad of) second lobe; a row of about nine beneath third lobe; a row of four or five beneath interval between third and fourth lobes. In a line with the last-mentioned row, but some distance cephalad, is an irregular series of twelve small round pores.

Embryonic larva with conspicuous blue-black eyes.

Habitat.—San Luis Potosi, Mexico, on shrub called "trueno," October 12, 1894. (Townsend No. 13; Div. Ent. Dept. Agr. No. 6442.)

Closely allied to *A. obscurus* Comst., but differs in color of exuviæ, shape of female, and number of orifices in grouped glands.

NOTE—Diagnostic descriptions of these species have been given under the title "Preliminary Diagnoses of New Coccidæ," and published in Supplement to Psyche, February, 1896 (pp. 18–20), in order to secure priority to Mr. Cockerell, the date of issuance of this bulletin being uncertain.—L. O. H.

Aspidiotus townsendi n. sp.

Female scale.—On upper side of leaf, 1 to 1½ mm. in diameter, circular or slightly oval, quite flat, thin, grayish white or rather almost transparent. Exuviæ central or nearly so, covered, round, pale orange, strongly contrasting with scale. First skin placed rather to the side of the second.

Male scale.—Similar but smaller and elongate, with the exuviæ toward one end.

Adult female.—Orange, when boiled in soda becoming colorless, with the terminal portion tinged with brown. Shape subcircular, occasionally reniform. Four groups of ventral glands, cephalolaterals 4 to 8, caudolaterals 5. Anal orifice large, oval, about twice its length from hind end. Two pairs of rounded lobes, median largest, not contiguous. Rounded incisions between the lobes, as in *uvæ*, *ancylus*, *cydoniæ*, etc. Plates forming a scaly fringe in the region of the lobes. Margin cephalad of the lobes, with six spine-like plates, branched at tips, the first (caudad) three the largest. An irregular row of oval dorsal pores some distance from margin of terminal portion.

Habitat.—Ciudad Porfirio Diaz (Piedras Negras), Coahuila, Mexico, November 17, 1894, on leaves of tree with entire or very slightly toothed ovate-lanceolate leaves, 33 to 57 mm. long. (Townsend; Div. Ent. Dept. Agr. No. 6466.)

I am obliged to regard this as a new species, but it is very near to *A. uvæ* Comst., and especially to the "physiological species" *A. coloratus* Ckll., which latter lives on *Chilopsis* in the Mesilla Valley, New Mexico. In *coloratus* both scale and exuviæ are concolorous pale orange brown, whereas in *townsendi* the scale and exuviæ strongly contrast. On superficial examination, the present species might perhaps be confounded with *aurantii*, *articulatus*, or *dictyospermi*, but a microscopical examination at once shows marked differences from any of these.

Aspidiotus yuccæ n. sp.

Female scale.—Small, greatest diameter about 1 mm. or a little over. Oval, moderately convex, dirty whitish, with the covered, inconspicuous, pale brown exuviæ to one end. Exuviæ when rubbed appear shining dark brown or black, very conspicuous. The scales leave a white mark when removed from the plant.

Adult female (boiled in alkali).—Transparent, very pale yellowish, sometimes brownish; mouth-parts and end of body tinged a deeper yel-

low. Shape nearly circular. Lobes dark brown, in strong contrast, appearing purple edged in some lights; margin cephalad of lobes also appearing purple. Three pairs of lobes, all low, the median ones largest, rounded, broad, not contiguous; the other two pairs rudimentary. Three pairs of spine-like plates, i. e., a pair between median lobes and one on each side adjacent to second and third lobes. These plates are conspicuous, sharp, much longer than the lobes. Very small, sac-like incisions between the lobes. A transversely elongate pore beneath space between median lobes and one beneath each second and third lobe. Anal orifice very far posterior, less than its length from hind end. No grouped ventral glands, but as the specimens have neither eggs nor larvæ they are probably not fully mature.

Habitat.—Ciudad Porfirio Diaz, Coahuila, Mexico, November 25, 1894, on a Yucca, doubtfully referred to *Y. australis.* (Townsend; Div. Ent. No. 6465.) Closely allied to *A. bowreyi* Ckll., which occurs on Agave.

Aspidiotus perseæ Comst.

Mr. Arthur de Cima, United States consul at Mazatlan, has been kind enough to send me a piece of cocoanut palm leaf from his garden. On it I find two examples only of an *Aspidiotus*, one too young to do anything with, the other just forming the true scale. Except that the plates are perhaps less branched, the insect agrees with *A. perseæ*, and I can do nothing but refer it thereto.

The following is a description of the specimen:

Female scale.—Diameter about 1 mm., circular, very slightly convex, opaque, reddish brown with the central portion blackish, exuviæ covered. True scale just forming, whitish, but would no doubt become darker with maturity.

Adult female.—Pale orange yellow, subcircular or very broadly pyriform; three pairs of distinct lobes and three others rudimentary. Median lobes small, rounded at ends, parallel sided, nearly as far apart as the width of one; second and third lobes oblique broad, low, finely serrate on their margins; third lobe longer than second, and with more serræ; fourth lobe a little longer than third, very broad and low, with its margin also serrate or finely crenulate; fifth lobe about as long as third, very low. Beyond this, three or four small serrated prominences indicate other rudimetary lobes. A pair of short, spine-like plates between median lobes, a pair between median and second, and also between second and third and third and fourth, those between second and third being somewhat largest of any. Long, sac-like, tubular glands between the lobes, or rather at their bases, those cephalad of second and third lobes being the longest. Numerous transversely oval pores as usual in some species. Four groups of ventral glands, caudolaterals of seven orifices, cephalolaterals of eleven. Anal orifice moderately large, pyriform, slightly caudad of level of caudolateral groups of glands. Surface finely striate.

This is very much like *A. scutiformis* in the characters of the female, but the scale is quite different.

Ceroplastes mexicanus n. sp.

Female.—Waxy scale, 6 mm. long, 5 broad, 3½ high. Wax moderately thin, grayish white with an ochreous tinge, smooth, without noticeable ridges or grooves. The wax is clearly separated into plates, though one has to look closely to see the sutures, which are concolorous with the rest of the wax. Plate nuclei small, dull, dark purplish, with the usual central spot of white secretion. Dorsum of denuded insect simply convex, caudal spine rudimentary. Derm yellowish brown, with round gland spots encircled by a suffused irregular ring of dark brown. Legs ordinary. Coxa with a pair of moderately long bristles at its end. Trochanter with a very long hair—as long as the femur. Femur only about as long as tibia. Tibia about one-third longer than tarsus. Tarsal digitules fairly long and stout, with large suboval knobs. Claw short, curved; digitules of claw stout, with large round knobs distinctly separate from the stalks. Antennæ of the usual lecaniine type, joints very obscure, but there appear to be certainly seven; 4 longest, a little longer than 3; 2 and 1 subequal; the last three shortest and subequal; formula 4, 3 (1, 2) (5, 6, 7); 4 with a very long hair and two short ones at its end; last joint with several hairs, but none nearly so long as that on 4.

Habitat.—San Luis Potosi and Guaymas, Mexico; on *Catalpa* sp., October 12, 1894. (Townsend No. 20= Div. Ent. Dept. Agr. No. 6434.)

In shape and size near to *C. cirripediformis* Comst., but at once separated by superficial appearance alone. It is superficially rather like *C. irregularis* Ckll., but that species is really quite distinct and does not show separate plates.

Coccus cacti L. subsp. **confusus** Ckll.

Habitat.—Near Arroyo, Tex., December 10, 1894, on *Opuntia.* (Townsend; Div. Ent. Dept. Agr. No. 5859.)

In the "American Naturalist" for December, 1893, I published an article on the different species of *Coccus.* Since then two important facts have developed, viz: (1) The antennæ of *C. confusus* are normally 7-jointed, as in the other species; (2) the Jamaican insect is not typical *C. cacti.* The races of *Coccus* now known to me are four in number. It seems preferable to regard them as subspecies of *C. cacti* rather than as distinct species.

(1) *C. cacti* Linn.—This I have seen alive only in Madeira. The females are comparatively large and sparsely covered with mealy secretion. Those I have studied had been purchased for the use of the chemical department of the New Mexico College. They are sold whole and ground down in a mortar to provide the pigment. I was surprised to find that the derm of these was very distinctly reticulate, the reticulations small and equally broad in any direction. The groups of gland orifices were brown, and therefore very conspicuous; the number of orifices in a group variable,

about seven on an average, perhaps. These orifices are considerably larger than in *confusus*. Antennæ as usual in the genus. Legs much larger than in *confusus*; femur stout. Truncate spines very narrow (in the Jamaican insect they are very broad), with some complete spines among them. The insect, flattened under a cover glass, is 5 mm. long and 3 broad.

(2) The Jamaican insect. Secretion profuse, as in *confusus*. Truncate spines thick, as in *tomentosus*. I am inclined to suppose that this may be the variety called "*sylvestre*," but as I have seen no clear description of that form I am in doubt.

(3) *C. tomentosus*. Found in the Guanajuato region of Mexico. The females are not imbedded in profuse secretion as in *confusus*, but are clearly separable, being nevertheless each one enveloped in secretion, and not almost naked as in typical *cacti*. This was supposed to be the "*sylvestre*" = *tomentosus*, by Lichtenstein, who had previously placed it (in MS.) as a new *Acanthococcus*. It appears that he noticed the insect, under the name *tomentosus*, in Bull. Soc. Ent. France, 1884.

Dr. Dugès kindly lent me a letter which Lichtenstein wrote him on July 4, 1884, containing the following passage, freely translated:

"I suppose you note that I have not published the *Opuntia* coccid under the name *Acanthococcus opuntiæ*, for I have found that Lamarck had named 'la Cochenille sylvestre du Mexique' *Coccus tomentosus*. I must use the specific name, though I am not sure that it is the same insect, not yet having been able to consult Lamarck's work in that of Thierry de Mérouville. I will do this in the winter."

I would not here publish Lichtenstein's original manuscript name did I not think that it would have to be brought into use, owing to the uncertainty about *tomentosus*. In such case we can call the Guanajuato form *C. cacti* subsp. *opuntiæ* (Licht. MS.).

(4) *C. confusus*. Antennæ 7-jointed in well-developed individuals; joint 4 decidedly longer than in Signoret's figure of *cacti*. Smaller than *cacti*, and enveloped in profuse secretion, so that I presume it would be impossible to use it commercially.

This is the form inhabiting the southwestern United States. The most northern locality from which I have seen specimens is Colorado Springs, Colo., November, 1894 (Professor Gillette). Professor Toumey sends it from Tucson, Ariz., on *Opuntia versicolor* Engelm.

Still another form, the *C. bassi* Targ., is quite unknown to me. In Ceylon, also, where the species has been introduced, Mr. E. E. Green recognizes not only the typical form, but a variety which he has named *ceylonicus*.

NOTE.—Mr. Clarence E. Rhodes, one of my students in zoology, has been working out the relative amounts of pigment, weight for weight of the insects as gathered, in the different forms of *Coccus*. Following a method suggested by Professor Goss, chemist of the New Mexico Agricultural Experiment Station, it was ascertained that taking commercial *C. cacti* as 100 the pigment in the same weight of *tomentosus* (*opuntiæ*) from Guanajuato was equivalent to 80, while that of *C. confusus* from Las Cruces was equivalent to only 16. It is evident that *confusus* is of practically no commercial value.

Genus CONCHASPIS Cockerell.

CONCHASPIS Ckll., Bull. Bot. Dept. Jamaica, No. 40, Feb. [publ. March], 1893; Journ. Inst. Jamaica, No. 6, April [publ. May], 1893; Gard. Chron., May 6, 1893. *Pseudinglisia* Newstead, Ent. Mo. Mag., July, 1893, p. 153.

Conchaspis angræci var. **hibisci** n. var.

Female scale.—Differs from *angræci* in being perhaps a little larger, grayish white, with the apex tilted over onto the side; strong ridges, about three in number, run from the apex toward the opposite margin.

Adult female.—Derm colorless, with the last three abdominal segments strongly tinged with brown. Shape elongate-oval. Mouth-parts large; rostral loop either hardly reaching to level of insertion of middle legs, or longer, reaching to insertion of hind legs. Eyes as usual in genus; round gland orifices or spinnerets also normal. Legs short; femur stout, decidedly longer than tibia and tarsus. Claw moderate. Antennæ short, somewhat tapering, brownish, 4-jointed, 2 somewhat longest, the others about equal in length. Abdomen ending in a pair of contiguous lobes, rapidly descending and notched without. Segments with long bristles on their lateral margins, usually a pair on each side but sometimes one, sometimes three. In the thoracic region these bristles are very long, but they become successively smaller on the abdomen.

Habitat.—Tampico, Mexico, on *Hibiscus* sp. prob. *floridanus*. (Townsend No. 28 = Div. Ent. Dept. Agr. No. 6439.)

This occurs on the twigs and leaf stems, whereas the typical *angræci* is found on the leaves of orchids. I place this as a variety of *angræci*, because there is so little in structure to distinguish it, but I presume it is a "physiological species," breeding true and never occurring on orchids.

Dactylopius olivaceus n. sp.

Female (in alcohol).—Long. 3½, lat. 2½, alt. 1½ mm.; dark olive brown, distinctly segmented; on drying becoming whitish from a covering of mealy powder. Posterior tubercles obsolete. Antennæ and legs brown; legs shorter than their distance from one another. Antennæ slender, distinctly narrower than tibia, 8-jointed; 8 extremely long, cylindrical, a little longer than 6 and 7; 1 large, longer than broad; 1, 2, and 3 subequal in length, then 6 and 7 subequal, then 5, then 4 very short; formula 8 (1, 2, 3) (6, 7) 5, 4; joints with sparse whorls of short hairs. Legs very stout, coxa extremely large, the trochanter large. Femur about as long as tibia and tarsus. Tibia about one-third longer than tarsus. Tibia and tarsus apparently with a longitudinal groove, but this appearance is certainly no groove, but seems to be the tendon of the extensor muscle. The usual four digitules present; the tarsal ones quite long, about as long as tarsus. These digitules all filiform, with small round knobs. Derm (by transmitted light after boiling) pale pinkish, transparent, with scattered small round gland spots. Hairs of anogenital ring very small and slender, easily overlooked. Embry-

onic larva pale pinkish; hairs of anogenital ring relatively much larger than in the adult.

Habitat—Ciudad Porfirio Diaz, Coahuila, Mexico, on *Yucca* (prob. *Y. australis*), November 25, 1894. (Townsend; Div. Ent. No. 6464.)

At first I thought I would not describe this species, having only alcoholic material, but its characters are so distinct that it will be easily recognized. It is something like *D. glaucus* Maskell, and is one of those forms which are only placed in *Dactylopius* because no better place can be found for them pending a revision of the dactylopiine genera, for which the time is perhaps hardly ripe.

Eriococcus dubius n. sp.

Female.—When dried, very dark reddish purple (boiled in caustic soda, does not stain liquid); length with sac a little over 3 mm.; sac loosely felted, white, with a slightly yellowish tinge; form as usual in genus. Derm colorless, with numerous stout spines. Legs and antennæ pale brownish yellow. Antennæ fairly slender, 7-jointed, 3 longest, and almost (sometimes quite) as long as 4 and 5, though sometimes 4 is nearly as long as 3; joint 4 longer than 5 and 6; 7 decidedly longer than 5 or 6; 5 longer than 6; formula 3, 4 (1, 2) 7, 5, 6, or 3, 4, 2 (1, 7) 5, 6. Legs moderately slender; coxa longer than tibia, but shorter than femur. Tibia and tarsus subequal; sometimes tibia, sometimes tarsus, a little the longer. Claw very large, not much curved. Digitules ordinary, slender but not filiform. Large bristles on inner side of tibia and tarsus. Hair on trochanter short, not half as long as femur. Posterior tubercles small, but cylindrical, as usual in genus. Anogenital ring with eight hairs.

Embryonic larva elongate, pink, with prominent posterior tubercles emitting the usual long setæ. Rows of spines down the back, as in larva of *Coccus*. Fifteen stout spines on each lateral margin, occupying posterior two-thirds of margin. Legs and mouth-parts large. Antennæ stout, 6-jointed, 3 longest, 4 and 5 shortest, 6 about as long as 4 and 5.

Habitat.—Valles, State of San Luis Potosi, Mexico, on a shrub not identified, but with leaves small, lanceolate, pale apple green above, densely stellate-pubescent beneath. (Townsend, October 13, 1894; Div. Ent. Dept. Agr. No. 6441.)

It is severely attacked by a species of *Leucopis*.

This species proves to be extremely close to *E. coccineus* Ckll., which is no doubt really neotropical, though so far only known from a Nebraska greenhouse. It would have made the differences between *dubius* and *coccineus* clearer if the former could have been described in its living state, but although I had a brief glance at *dubius* before Professor Townsend sent it to Washington it did not occur to me to make any descriptive notes at the time, since I had no idea that I should be the one to introduce the species into the literature. It has been

suggested that this is perhaps not a true *Eriococcus*, but I must agree with Mr. Maskell in placing such forms as this in that genus.

Lecanium imbricatum n. sp.

Female (on twig) about 4 mm. long, oval, moderately convex, much wrinkled, no doubt from contraction in drying, therefore probably soft when alive. Reddish brown, moderately shiny, more or less covered, especially at sides, with a thin, fragile coat of glassy secretion. Derm thickly beset with large brown glands, which, viewed laterally, are broadly fusiform. Anogenital ring with eight long hairs, about as long as the anal plates. Anal plates yellowish brown, longer than broad, with the outer sides nearly equal and meeting at about a right angle. Antennæ very short but thick, rudimentary, joints not distinguishable; tip with several hairs. Legs rudimentary, very short and stout; the femur might almost be described as oval.

Male.—Scale as usual in genus, white, glassy, rugose; very numerous on twig, overlapping one another like tiles on a house or the involucral bracts of a composite plant.

Habitat.—Alta Mira, Tamaulipas, Mexico, on Mimosa, October 15, 1894. (Townsend; Div. Ent. Dept. Agr. No. 6440.)

A very interesting species, of a neotropical type, characterized by a nonreticulate derm with large glands, antennæ and legs often rudimentary or wanting, surface more or less covered with waxy or glassy secretion. The curious South American forms of *Lecanium*, mostly appertaining to this type but very diverse among themselves, have remained practically unknown; at the present time several new species, brought to light by Dr. von Ihering, can only be regarded as a small portion of those which doubtless exist.

The nearest ally of *L. imbricatum* certainly appears to be *L. urichi* Ckll., discovered in Trinidad, but lately received also from Brazil. The Brazilian examples are on *Smilax campestris* Griseb., Rio Grande do Sul (Dr. von Ihering); they seem certainly to belong to *urichi*, but whereas in the types of that species I found no antennæ, on examining a Brazilian example I find short, pale antennæ of about seven joints.

Orthezia sonorensis n. sp.

Female.—Length 2½ mm., with ovisac 11 mm.; breadth of sac 3⅓ mm. Dorsum covered by the white secretion, except a small area posteriorly. Four strong laminæ on each side projecting backward over base of ovisac; median lamina (or pair) very much abbreviated. Derm transparent, thickly beset with small spines. Legs orange brown, coxa broader than long, femur about as long as tibia, tarsus hardly more than half as long as tibia; claw stout, not much curved; claw and distal half of tarsus dark brown. Tibia and tarsus with numerous short stout spines on inner side. [Antennæ broken in the adults examined.] Immature form with 7-jointed antennæ; formula 7, 3 (1, 2, 4) 5, 6; 5 very nearly as long as 4, 7 very slender. Earlier stage with 6-jointed antennæ;

formula 6, 3, 1, 4 (2, 5); 4 sometimes much more slender than 3. Anogenital ring with six distinct hairs. Claw with very small digitules.

Habitat.—San Ignacio, Sonora, Mexico, on "gecota," *Hymenocloa monogyra.* (Townsend, October 4, 1894; Div. Ent. Dept. Agr. No. 6448.)

The affinities of this fine species are clearly with *O. annæ* Ckll., which it much resembles. These forms are of the type of *O. urticæ* Linn. as regards the formation of the laminæ or lamellæ of white secretion.

The following form, closely allied to *P. yuccæ*[1] Coq. (*D. mexicanus* Ckll.), has just been received from Antigua:

Phenacoccus yuccæ, n. var **barberi** Ckll.

Female.—In spirits looks like a *Monophlebus*, the cottony secretion having been lost; whitish, nude, shiny, segmentation distinct; length about 5, breadth about 2½ mm.; legs and antennæ pale reddish brown (very much paler than those of *P. yuccæ*), shiny. Anogenital ring with six stout bristles. Posterior lobes rounded, low, inconspicuous, with a few hairs and numerous short spines, after the manner of *Dactylopius.* Antennæ 9-jointed, the joints subequal, very distinct, bearing whorls of hairs; 9 about one-third longer than 8; 7 a little longer than 8; 2, 4, 5, 6, and 7 practically equal, 2 perhaps slightly the shortest; 3 a little longer than 4; 1 about as long as 2; formula 9, 3 (1, 2, 4, 5, 6, 7) 8. Legs large, ordinary, tibia somewhat longer than femur; tibia and femur each with two rows of stiff bristles, tibial bristles about twelve in a row, femoral about seven. Trochanter with five bristles and one long hair. Tarsus extremely short; excluding claw, it is of the same length as last joint of antenna. Claw large, curved, with a small but very distinct denticle on its inner side. Tarsal digitules filiform, with minute but distinct knobs; digitules of claw filiform. Sides of segments with round patches of small spines.

Habitat.—Collected by Mr. C. A. Barber, in Antigua, on *Allamanda* and *Thunbergia grandiflora*, and also observed by him on *Coleus* and *Croton* growing near the *Thunbergia.* Mr. Barber also sent me numerous specimens which he found on a plant not identified, at St. Kitts.

Although the material sent was abundant, it was all in alcohol and included no males; hence I am unable to determine whether we have to do with a distinct species or not. The distinctions from *yuccæ*, so far as can be made out from the alcoholic material, are very slight, although *barberi* can be easily separated by the pale legs and antennæ. These forms are not typical *Phenacoccus* (*Pseudococcus* Auctt.) by any means, and will doubtless have to be eventually placed in a distinct genus or subgenus. I hesitate to make such a change now, because the whole dactylopiine series stands in need of generic revision, and it will be better to let the matter rest until this work can be taken in hand.

[1] I have received alcoholic specimens of this insect from Mr. Urich, collected in Trinidad. They show joint 3 of antennæ rather longer than 9; otherwise they agree excellently with the *barberi* from Antigua. Mr. Urich writes that he found them in St. Anns, on orange trees, but they were not common.

A LIST OF SCALE INSECTS FOUND UPON PLANTS ENTERING THE PORT OF SAN FRANCISCO.

By ALEXANDER CRAW,

Quarantine Officer and Entomologist, State Board of Horticulture, California.

Name of species.	Country.	Trees and plants.
Aspidiotus albopunctatus *Ckll*	Japan	Orange.
aurantii *Mask.*[1]	Australia	Orange and Fourcroyia.
	Central America	Cocoanut palms.
citrinus *Coq.* MSS.[2]	Japan	Orange, Aucuba, Euonymus.
duplex *Ckll*	do	Camellia, orange, camphor, azalea, Olea fragrans, tea.
ficus *Ashm*	do	Orange, banana, Ilex, Aspidistra.
	Florida	Orange.
	Cuba	Palms (Latania borbonica).
rossii *Mask*	Australia	Palms, olives, Acacia, Araucaria bidwellii.
sphærioides *Ckll*	Louisiana	Ornamental plants.
nerii *Bouché*[2]	Eastern States	Palms.
	Australia	Do.
	Honolulu	Do.
Aulacaspis sp	Japan	Aspidistra lurida.
Asterolecanium pustulans *Ckll*	Honolulu	Oleander.
Ceroplastes ceriferus *Anderson*	Japan	Camellia, orange, gardenias.
floridensis *Comst*	Florida	Orange.
rubens *Mask*	Honolulu	Asplenium fern.
sp	Singapore	Cinnamon.
	Japan	Gardenia fortunii.
Chionaspis aspidistræ *Sign*	do	Aspidistra lurida.
assimilis *Mask*	Australia	Eucalyptus?.
biclavis *Comst*	Tahiti	Orange.
	Southern Mexico	Lime.
citri *Comst*	Australia	Orange.
	Japan	Osmanthus, Aspidistra.
	Samoa	Palms.
difficilis *Ckll*	Japan	
Diaspis amygdali *Tryon*	do	Cherry, peach, plum, apricot, prune, walnut, persimmon, Eleagnus.
patellæformis *Sasak.* (?)	Honolulu	Shrub.
rosæ *Bouché*[2]	Eastern States	Blackberry, rose.
	Central America	Rose.
Dactylopius aurilanatus *Mask*	Australia	Araucaria bidwellii.
adonidum *Linn.*[2]	Eastern States	Croton.
destructor *Comst*	Florida	Orange.
longifilis *Comst*	Eastern States	Dracæna.
pandani *Ckll*	Washington Island, Marq.	
albizziæ *Mask*	Honolulu	Orange.
Eriococcus sp	Australia	Palms.
araucariæ *Mask.*[2]	do	Araucaria excelsa.
Fiorinia camelliæ *Comst.*[2]	Belgium	Camellia.
	Japan	Do.
Icerya purchasi *Mask.*[2]	Australia	Pittisporum.
	Hawaii	Rose.
Ischnaspis filiformis *Doug.*[2]	Japan	Pandanus.
Lecanium filicum *Sign*	New Zealand	Ferns.
hesperidum *Linn.*[2]	Florida	Orange, lemon.
	Honolulu	Orange.
	Australia	Rose.
longulum *Dougl*	Honolulu	Carica papaya.
perforatum *Newst*	do	Palms.
tessellatum *Sign.* (?)	Hawaii	Ferns.
oleæ *Bern.*[1]	Japan	Deciduous magnolia.
	Hawaii	

[1] Established in California for over twenty years.

[2] Found to a limited extent in California, and, with the exception of the two species of *Mytilaspis*, are not feared, as they are mostly held in check by predaceous insects.

Quarantine Officer and Entomologist, State Board of Horticulture, California—Cont'd.

Name of species.	Country.	Trees and plants.
Mytilaspis carinatus *Ckll*	Central America	
citricola *Pack.*[1]	Florida	Orange, lemon.
	Tahiti	Orange.
crawii *Ckll*	Japan	Eleagnus.
gloverii *Pack.*[1]	Florida	Orange.
	Japan	Orange, Magnolia fuscata.
	La Paz	Orange.
Parlatoria pergandei *Comst*	Florida	Do.
proteus *Curtis*	Turkey	Found in San Bernardino County, on imported date palms.
theæ *var.* viridis *Ckll*	Japan	
sp	China	On orange leaves, wood, and fruit.
ziziphi *Lucas*	Italy	Lemons.
Poïlinia costæ *Targ.-Toz*	do	Found on olive in Los Angeles County, and destroyed by Horticultural Commissioner John Scott.
Pulvinaria camelliæ *Sign*	Belgium	Camellia.
	Japan	
psidii *Mask*	Hawaii	Ferns, orange, coffee, pomegranate, alligator pears. A few plum trees in San Bernardino found infested and cleaned out by owner.
Planchonia fimvriata *Fonscol*	Mexico	Climbing plant.
Orthezia sp	Eastern States	Hothouse plants.

[1] Found to a limited extent in California, and, with the exception of the two species of *Mytilaspis*, are not feared, as they are mostly held in check by predaceous insects.

SOME COCCIDÆ FOUND BY MR. ALEX. CRAW IN THE COURSE OF HIS QUARANTINE WORK AT SAN FRANCISCO.

By T. D. A. Cockerell, *Las Cruces, N. Mex.*

Chionaspis difficilis n. sp.

Female scale.—About 2 mm. long, irregular, from round to subelongate, slightly woolly in texture, white, moderately convex; exuviæ to one side, rather inconspicuous, second skin black or nearly so; first skin pale straw color, about one-third on second, but on the side toward the middle of the scales sometimes the exuviæ are reddish. Removed from the twig the scale leaves a very conspicuous snow-white patch.

Male scale.—White, tricarinate, exuviæ almost colorless.

Adult female.—Plump, orange rufous with a slight purple tinge; in caustic soda bluish green, with the pygidial parts dull orange. Five groups of ventral glands, caudolaterals of about 43, cephalolaterals about 41 to 43, median about 37. Median lobes brownish, large, close together at their base, diverging at nearly a right angle; the two sides of the lobe, if produced to a point, would meet at nearly a right angle. These lobes are perfectly entire, or at most very slightly notched on each side. Next each median lobe is a spine-like plate, not so long as the lobe; then the small, low, deeply bifid or bipartite second lobe, adjacent to which is a spine; then two or three spine-like plates, longer than the lobes; then the third lobe, low and bifid like the second, its caudal half larger than the other; then three spine-like plates, resembling the other three; then a rather long interval, on which are three small, low, pyramidal projections, the third with a spine next to it; then four spine-like plates; then a long unbroken or slightly serrate interval; then four or five pairs of large spine-like plates. The anal orifice is a long way from the hind extremity. There are conspicuous rows of oval pores marking the obsolete segments.

Habitat.—Japan, on bark of branches of *Elæagnus*, found by Mr. Craw in his quarantine work, November 13, 1895.

This is one of those puzzling forms which might as well be placed in *Diaspis* as *Chionaspis*. The female presents the closest resemblance to *D. amygdali* Tryon, but the median lobes are practically entire and the glands in the groups appear to be more numerous. The last feature, however, varies in *amygdali*, and doubtless will in *difficilis*. The female scale differs at once from *amygdali* in the color of the exuviæ, and the male scale is quite distinct, being well tricarinate. *Chionaspis major* Ckll. has the tricarinate male scale, but *difficilis* differs from that in its

smaller scale, as well as in its more *amygdali*-like lobes. *Chionaspis prunicola* Mask., which its author scarcely knew whether to put in *Chionaspis* or *Diaspis*, is another similar form. It has not, however, the tricarinate male scale of *difficilis*.

Aspidiotus albopunctatus n. sp.

Male scale.—Very small, hardly over one half mm. broad, circular, becoming at length elongate by the production of one side, and then over 1 mm. long. Slightly convex, dull black, inclining to grayish; exuviæ marked by a white dot surrounded by a black ring. Removed from the bark, the scale leaves a white patch without any dark ring.

Female scale.—Circular, flat, extremely inconspicuous, dull pale ochreous, more or less blackish; on examining the scale from beneath, it is seen that the exuviæ are large and orange. Probably the few female scales seen are not quite adult. Their diameter is about 1 mm.

FIG. 1.—*Aspidiotus albopunctatus* (from drawing by Cockerell).

Adult female.—Pale yellow, of ordinary circular shape; pygidial area striated, no groups of ventral glands. Two pairs of lobes only; median lobes large, close together but not touching, rounded, notched on the outer side and sometimes slightly on the inner; second lobes much smaller, strongly notched on the outer side. Plates spine-like, not very large. Beyond the lobes the margin appears to present three or four irregular serrations, which in well-developed specimens take the form of double spine-like plates. There are two pairs of sac-like incisions, as in *perniciosus*.

Habitat.—Japan, on twigs of orange seedlings, found by Mr. Craw in his quarantine work.

This might easily be considered a form of *A. perniciosus*, which, however, does not seem to affect citrus trees, and is not found on the plums, peaches, etc., from Japan. The characters are almost exactly those of *perniciosus*, but the male scales of the latter have the exuviæ more or less yellowish. The relationship between the two is quite as close as that between *Mytilaspis pomorum* and *citricola*, and I confess that it would not have occurred to me to separate *albopunctatus* as a distinct species but for its habits and locality. It is, in fact, what I have called a "physiological species."

Parlatoria theæ var. **viridis** n. var.

Female scale.—About 1½ mm. long, nearly circular, but the exuviæ projecting at one side give it a broad pyriform outline. From one-third to two-thirds of the first skin overlaps the second. First skin dark greenish to greenish black. Second skin about twice as long as first, nearly round, dark greenish to black, with sometimes a narrow brown

margin. Scale very little convex, white, with a more or less pronounced grayish yellow tinge. Removed from the bark it leaves a white mark.

Adult female.—Very broad, oval, bluish green, with the pygidial area pale orange and the region about the mouth-parts suffused with vandyke brown. Five groups of ventral glands, caudolaterals of 16 to 17, cephalolaterals 9 to 16, median 1 to 4. Lobes pale brown. Three pairs of well-formed lobes, two others rudimentary. Median lobes well produced, squarely incised on each side, the inner notch not so near the end of the lobe as the outer. Second lobes smaller, notched only on the outer side. Third lobes much like the second, but also feebly notched on the inner side near the end. Rudimentary lobes pointed. The scale-like plates, strongly serrated at their ends, are not so long as the median lobes, and not longer than the second and third. There is a pair between the median lobes, a pair between the first and second, and three between the second and third, three also between the third and fourth lobes, and four between the fourth and fifth.

FIG. 2.—*Parlatoria theæ* var. *viridis* (from drawing by Cockerell).

Habitat.—On bark of twigs of an ornamental plant from Japan, found by Mr. Alex. Craw in his quarantine work.

The species of *Parlatoria* are not easy to define, and I really do not know whether in the present case we have to do with a valid species or a variety of *theæ*. At any rate, *viridis* may be known by the more produced tips of the median lobes, the median plates as long as those between the first and second lobes, the bright green color, the five groups of ventral glands, and the pale flattened scale. In *viridis* the lateral groups of glands almost or quite touch one another, while in *theæ* they are well apart. From Maskell's species, *myrtus* and *pittospori*, *viridis* differs at once by the plates being not longer than the lobes. From Del Guercio's *P. targionii* (sub *Aspidiotus*) it differs by the dark exuviæ and other characters. Nor will it agree with the other species, *pergandei*, *proteus*, *zizyphus*, and *victrix*.

Mytilaspis crawii n. sp.

Female scale.—Narrow, about 2⅓ mm. long and one-half mm. wide, slightly curved, pale orange yellow, exuviæ concolorous.

Adult female.—Yellow. Four groups of ventral glands, caudolaterals of 3, cephalolaterals of 4 in a row. Median lobes very large, rounded at ends, their edges finely serrate. They are closely adjacent at a point at the base, being separated, however, by a pair of small spine-like plates; thence they diverge at nearly a right angle to their rounded ends, thence

rapidly sloping, the outward slope longer than the inner, and diverging from it at an angle of about 80°. Next to the outer side of each median lobe is a small spine-like plate, then a sac-like incision, then the small second lobe, shaped much like the last joint of a finger and in bulk hardly one-tenth of a median lobe. Following this is a small sac-like incision, then a pointed projection, then two saccular incisions, then after a short interval a spine-like plate, then another sac-like incision, then a long interval of smooth margin, then another sac, then another interval, in the middle of which is a small spine. Below the sac-like incisions are transversely elongate pores.

Habitat.—Japan. Found by Mr. Craw in the course of his quarantine work, on leaves of an *Elæagnus* from Japan. I do not know the species of *Elæagnus*, but the leaves are about 3 inches long and $1\frac{3}{8}$ inches broad. The scale is extremely inconspicuous, as it lives *beneath the epidermis* on the underside of the leaf along the midrib. By this habit and the large median lobes it will be readily distinguished. From *M. grandilobis* Mask., which has the large median lobes, it is known by the entirely different color of the scale, etc. Several of the specimens were parasitised.

Mytilaspis carinatus n. sp.

Female scale.—$3\frac{1}{4}$ mm. long; second skin about 1 mm., first skin about one half mm., about one-half on first. Width of scale three-fourths mm. Scale very pale brown, strongly keeled, almost exactly straight, narrow, not shining; exuviæ dull orange. Male scale similar but smaller, with only one pellicle.

Adult male.—Ordinary, well winged.

Adult female (in caustic soda).—Of the ordinary shape, pale yellow. Groups of ventral glands nearly obsolete, but in one example the cephalolateral group, of 4 orifices, is distinct; and the caudolateral, also of 4, is imperfectly developed. There are rows of well-marked elongate pores marking the obsolete segments. Anal orifice a long distance from hind end. Three pairs of lobes, all very small, narrow, and inconspicuous, the median largest, shaped something like a blunt canine tooth, widely separated, with a pair of spine-like plates between. Outside each median lobe is a long spine-like plate, much longer than the lobe, then a short one, then a slight projection; then the third and second lobes, close together but not touching, of about the same size, and

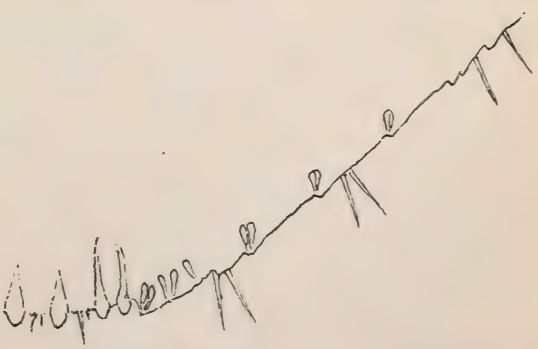

FIG. 3.—*Mytilaspis carinatus* (from drawing by Cockerell).

nearly of the shape of the median lobes: then comes a raised portion, gradually sloping, and exhibiting four or five marginal sacs of no great length; then a notch and two very large spine-like plates, then after a short interval a notch marked by a pair of marginal sacs, then after a rather long interval another notch and pair of sacs, then shortly after another pair of very large spine-like plates, then after a rather long interval a notch and pair of sacs, then after a somewhat longer interval a couple of notches, then a large spine-like plate, then a notch, then a large spine-like plate. The notches might as well be described as serrations.

Habitat.—Found by Mr. Alex. Craw in his quarantine work, October 26, 1895, "upon plants like *Anthurium* arrived from Central America." It occurs on the leaves, in moderate numbers, scattered. It has a certain superficial resemblance to *M. citricola*, but differs at once by the narrower, keeled scale.

SOME NEW SPECIES OF JAPANESE COCCIDÆ, WITH NOTES.

By T. D. A. Cockerell, *Las Cruces, N. Mex.*

I am indebted to Mr. Howard for permission to study some of the interesting Coccidæ found in Japan by Mr. Takahashi when acting as temporary agent of the Entomological Division of the Department of Agriculture. Two of the species described herewith are so anomalous as to form the types of new subgenera; and it is questionable whether they should not rather be placed in new genera altogether.

Genus PULVINARIA.

TAKAHASHIA new subgenus.

Similar to ordinary *Pulvinaria* in general structure, but forming a very long, firm, cottony ovisac, which projects from the twig in a curve about 17 mm. long, carrying on its end the shriveled body of the female.

Mr. Takahashi must forgive me for saying that this is a truly Japanesque insect, and well deserves a subgeneric name which may recall not only its discoverer, but the land from whence come many quaint and beautiful things.

Pulvinaria (Takahashia) japonica n. sp.

Female (in its shriveled condition) about 6 mm. long, reddish brown, blackish on dorsum; carried on the end of a long, curved, white ovisac, about 17 mm. long, firm, cottony, with the fibers running longitudinally. Boiled in caustic potash: derm slightly pinkish, with numerous round gland orifices and apparent short spines, which latter may represent portions of secreted matter protruding. These orifices, etc., not observed at the sides. Rostral loop short. Anal plates dull orange, longer than broad, with their outer angle rounded, and two pairs of strong bristles on inner edge close to posterior end. Anogenital ring with stout hairs, few (I think six) in number. Legs and antennæ very small. Legs ordinary, except that the anterior ones seem to have 2-jointed tarsi. This character is peculiar and will require further study with more material. Trochanter with two hairs, one longer than the other. Femur short, about as long as tibia. Tarsus slender, about two-thirds length of tibia. Claw straight, a little hooked at end; the usual digitules of claw and tarsus present, but all very slender and small. Tarsal digitules extending about as far as tip of claw; digitules of claw

extending a little beyond. Knobs distinct. Antennæ short and stout, 7-jointed; 3 much longest, 4 and 6 equal and shortest; 2 and 5 about equal, also 1 and 7; formula 3 (7, 1) (2, 5) (4, 6); 1, 2, and 4 broader than long; 5 about as long as broad.

Habitat.—Tokio, Japan, on mulberry. (Takahashi; Div. Ent. Dept. Agr. No. 5821.)

Pulvinaria aurantii n. sp.

Female, with white cottony ovisac, scattered over under surface of leaf, looking just like *P. psidii* Mask. The ovisac is about 5 mm. long, irregular or suboval in shape. The shriveled female is ochreous or greenish. Marginal spines numerous, unusually long, quite strong, never branched. Spines of lateral incisions in threes, two small, one large. Rostral loop extremely short. Anal plates together forming about a square. Anogenital ring with numerous hairs. Legs ordinary; tarsus much shorter than tibia; tibia with a very long hair near its end, and a shorter one proximad. Claw short, blunt, curved; digitules of claw very large and stout, with large knobs. Knobs abrupt; stalk comparatively slender, but bulbous at base. Antennæ 8-jointed; 3 longest, but not much so; 2, 4, 5, and 8 subequal; 5 seems a little longer than 4; 6 and 7 equal and shortest; 5 with a very long hair.

Habitat.—Tokio, Japan, on orange. (Takahashi; Div. Ent. Dept. Agr. No. 5941.)

This species looks just like *P. psidii* Mask., and I had almost taken it for granted that it was that species. Microscopic examination, however, at once reveals striking differences, especially in the marginal spines, so that there can be no question about the distinctness of the Japanese form. The following notes on *P. psidii* will serve for comparison and to amplify the published account of that species:

Pulvinaria psidii Maskell.

(1) Material from Maskell, from type locality, Sandwich Islands.

Marginal spines very much smaller and more numerous than in *aurantii*, easily broken off. Those near lateral incisions rather larger than the rest, and broadened and serrate at the ends. Three spines in lateral incisions, one long, two short, as in *aurantii*. Femur and trochanter distinctly longer than corresponding parts of *aurantii*. Tibia with only a short hair near end.

(2) Material from E. E. Green, found in Ceylon.

Shows similar short spines, which *tend to enlarge and branch at ends.* Anal plates together form about a square. Anogenital ring with six long stout hairs. Trochanter with a very long bristle; coxa with two rather short bristles, one shorter than the other. Tibia with a moderately long hair near end. Claw short and curved; digitules of claw practically as in *aurantii*, but knob hardly so abrupt. Antennæ 8-jointed; 3 very much the longest; 4 decidedly longer than 5; 6 and 7

shorter than 5, subequal, narrower in proportion to their breadth than in *aurantii*; 8 about as long as 4; 2 nearly as long as 4.

Pulvinaria tecta Maskell.

A word seems necessary as to this species, since it has been found on orange in Australia. It differs from *P. aurantii* in occurring in masses on the twigs, the females almost smothered in the cotton; in the antennæ, especially in the short second joint; also in the filiform digitules of the claw. These particulars are gathered from Maskell's description; I have not seen *tecta* myself. The marginal spines of *P. tecta*, as figured by Maskell, resemble those of *aurantii*.

Genus SPHÆROCOCCUS.

PSEUDOLECANIUM new subgenus.

Adult female more or less oval, lecanium-like, living exposed on plant or more or less protected by the sheathing bases of leaves; not visibly segmented in adult; antennæ and legs wanting; margin with capitate spines; larva excessively elongated.

Sphærococcus (Pseudolecanium) tokionis n. sp.

Adult female, simply a sac containing larvæ; irregular, more or less oval, about 6 mm. long, dark brown, shiny. Living on twigs and producing a little cottony matter.

I did not succeed in finding legs or antennæ, and believe them to be absent. Margin with capitate spines, shaped like little Agarics. (Spines such as these occur also in *Ceroplastes*.)

As in *Kermes*, which the insect in many ways suggests, the larva affords the best characters. It is very curious that while the adult female is so excessively degenerate, the very young larvæ which pack her body full exhibit more differentiation of parts than is usual in coccid larvæ. The larval antennæ, for example, are like those of an adult coccid, and very different from those usually exhibited by larvæ; so also with the legs. It would seem, in fact, as if ancestral adult characteristics had been pushed back into the earliest larval stage.

Larva pale pink, distinctly segmented, excessively long and narrow, with sides approximately parallel. Skin very finely, longitudinally striated. No hairs on anal ring. Two long caudal bristles, which, bent back, reach about the insection of last pair of legs. No anal lobes; hind extremity notched, with six short blunt spines. A row of stout but short spines along each side, as in a *Kermes* larva. Cephalic end with a row of about ten tubular glands. Legs ordinary; digitules slender, those of claw short, those of tarsus long, extending far beyond those of claw. Tibia longer than tarsus, as is usual in adult (not larval) coccids. Antennæ 6-jointed; the joints very distinct, with strong constrictions between them; joints with short hairs, last one

with an excessively long one; 3 a little longer than 6, and longest; 1 about as long as 6, or a little shorter; 4 and 5 subequal; 2 shortest. Formula 3, 6, 1, 5, 4, 2.

Habitat.—Tokio, Japan, on bamboo. (Takahashi; Div. Ent. Dept. Agr. No. 6308.) Judging from the twigs sent, the bamboo must be one of the smaller ornamental species.

When I saw this, I thought at once of the Sandwich Island *Sphærococcus bambusæ* Mask. I have specimens of this latter, kindly sent me by Mr. Maskell, and it is evidently distinct, though similar in general appearance. The adult female of *bambusæ* is distinctly segmented posteriorly, and so hardly resembles a *Lecanium*, except in the texture of the skin. The larvæ of the two species are also easily distinguished.

The various species which Maskell has described under *Sphærococcus* are strikingly diverse in their characters, and this species may be placed there for the present without widening very much, if at all, the bounds already set by the author of the genus.

Genus LECANIODIASPIS.

Subgenus PROSOPOPHORA Douglas.

Never having seen the type of *Lecaniodiaspis* (*L. sardoa*), I had taken it for granted that Douglas was correct in separating *Prosopophora* as a distinct genus. Recently, finding that *Lecaniodiaspis yuccæ* was undoubtedly a *Prosopophora*, I was led to look more closely into the matter, with the result that I can not separate Douglas's genus satisfactorily from Targioni-Tozzetti's. In leaving *Prosopophora* as a subgenus, I believe I give it the best rank it is entitled to, and even that may be called into dispute.

With the Japanese species described below, the genus contains the following:

(1) *Lecaniodiaspis sardoa* Targ., Mediterranean region.
(2) *L. yuccæ* Towns., New Mexico.
(3) *L. yuccæ* var. *rufescens* (Ckll.), New Mexico and Colorado.

The true *yuccæ* is rounder in outline than *rufescens* and has 7-jointed antennæ, whereas *rufescens* shows distinctly 8 joints. The number of antennal joints is known not to be constant in *L. dendrobii*, and I do not think the difference observed between *yuccæ* and *rufescens* indicates more than a variety. The former was first published and so must stand for the species. It was credited to Riley MS., but the only description which has appeared was written by Professor Townsend.

The var. *rufescens* occurs on chenopodiaceous plants. The Colorado habitat is now first made known; it was sent by Professor Gillette thickly infesting twigs of *Sarcobatus vermiculatus* from Grand Junction, Colo. Some of the specimens in this lot were parasitized.

4. *L. dendrobii* (Dougl.), Demerara.
5. *L. quercus* n. sp., Japan.
6. *L. eucalypti* (Mask.), Australia.
7. *L. acaciæ* (Mask.), Australia.

Lecaniodiaspis (Prosopophora) quercus n. sp.

Adult female.—Scales numerous on twigs. Long. 3½, lat. 2½, alt. 2⅓ mm. Pale ochreous, obscurely carinate, segmentation fairly evident. Boiled in caustic potash, they turn it sherry color. Female (after boiling), dark reddish brown. Antennæ 7-jointed, the joints cylindrical; 1 shortest, much broader than long; then 6 and 7 subequal, much longer than broad; then the other four subequal, but 3 rather longer than 2. Formula (3, 4) (2, 5) (6, 7) 1. Derm with numerous gland orifices and false spines, as usual in genus; derm has a finely marbled appearance, due to minute wrinkles. Margin with a few, short, true spines. Anogenital ring and other characters as usual in the genus. Legs, of course, wanting.

Young larva (squeezed out of the transparent egg-shell) pale pink, rostral filaments curled in two watch-spring-like coils. Antennæ 6-jointed, 2, 3, and 6 subequal and longest. Legs stout, femur about as long as tibia and tarsus. Coxa quite large. Trochanter with two strong curved bristles. Tibia with a long curved bristle on its inner face; tarsus with a small bristle on its inner face. Claw hooked at end; digitules filiform, well developed; tarsal digitules long. Caudal filaments bent back, not nearly reaching insection of last pair of legs. Anogenital ring with distinct hairs.

Habitat.—Tokio, Japan, on *Quercus* sp. (Takahashi; Div. Ent. Dept. Agr. No. 5940.)

This species very much resembles *rufescens*, but is more convex. The occurrence of two species so closely allied, of a peculiar genus, in Japan and New Mexico respectively, is very interesting; similar instances in other groups are known, especially those pointed out by Asa Gray among plants. The conclusion is that we have to do with an old type, which formerly occupied more territory than at present.

Signoret remarked that *L. sardoa* much resembled *Eriococcus buxi* in superficial appearance. *L. quercus* is about the color of the sacs of *Eriococcus eucalypti* Mask., and might easily be taken at a glance for an *Eriococcus*.

Aspidiotus secretus n. sp.

Female scale.—White, shiny; exuviæ exposed, shiny, rather large, very pale yellow, placed rather to one side.

Immature female (boiled in potash) almost colorless, terminal portion brownish; outline nearly round; mouth-parts far posterior, almost as in a *Parlatoria*. No groups of ventral glands. Lobes and spines present, but no plates. Three pairs of lobes; median large, strongly diverging, pyramidal in outline, rounded at ends. On the rapidly descending distal side of each median lobe, at the base, is a small triangular projection. Second lobes separated from this triangular projection by a space about equal to their width. Second lobes smaller than median, but well developed, notched on each side at end so as

to be obscurely trilobed. Two very small projections immediately following second lobe. Third lobe a great distance from the second, small and tooth-like.

Habitat.—Tokio, Japan, on bamboo. (Takahashi; Div. Ent. Dept. Agr. No. 5944.)

Living crowded under the epidermis. The concealed habitat of this species is peculiar; the scales are so closely packed as to be with difficulty separated. In the scale, the insect somewhat resembles such species as *A. nerii*, but the characters of the female are quite different. It is possible that there are delicate and easily deciduous plates, but I found none in the specimens examined by me. The lobes also are peculiar. When I saw the insect under the microscope, I was at once reminded of *A. bossieæ* Mask., but our insect is certainly quite distinct from that, and may not be even closely related.

FIG. 4.—*Aspidiotus secretus* (from drawing by Cockerell).

Aspidiotus duplex n. sp.

Female scale.—About $2\frac{2}{3}$ mm. diameter, subcircular, moderately convex, dark blackish brown with the large round exuviæ nearly to one side and orange in color. Removed from the bark, a white patch is left, representing the so-called ventral scale. Female (boiled in potash) pale orange, broadly oval or subcircular, with the large cephalic portion separated from the rest by a deep suture. Mouth-parts large. Skin on dorsum very strongly, transversely grooved, the grooves linear, often anastomosing. Four groups of ventral glands in the usual situation, caudolaterals of 28 to 30, cephalolaterals of 42; median group represented by two orifices, not very close to one another. Besides these groups, there is a group of 17 to 22 orifices, quite similar in character, on each side of the mouth-parts; these groups are oval in outline. The anus is about on a level with the anterior ends of the caudolateral groups. There are four (two on each side) long tubes or ducts originating about the region between the caudolateral groups and the anus, and passing hindward, practically parallel, to the end of the body. On the dorsal surface the segments are marked by rows of oval pores. The "pygidium" shows on the dorsal surface a very distinct latticework, as in *A. theæ* and *Ischnaspis filiformis*. Median lobes very large, brown, rounded at ends, but notched on each side so as to be trilobed; the lateral lobes very small and passing into the straight parallel sides. The median lobes are very close together, but distinctly separated, not touching, not diverging. There are three other pairs of lobes, small, narrow, rounded at ends, very inconspicuous and easily overlooked among the scale-like plates. Plates not extending beyond lobes, scale-like, not separately distinguishable, but forming a continuous fringe

which rapidly narrows beyond fourth lobe, and ceases before the deep notch which indicates another segment. Margin cephalad of fourth lobe distinctly serrate, serrations coarse.

Habitat.—Tokio, Japan. (Takahashi; Div. Ent. Dept. Agr. No. 5643.)

At first sight there appears some resemblance to *Aonidia*, but that genus really represents circular *Fiorinia*. The present insect, *Aspidiotus duplex*, has a sort of double scale, for the brown true scale is covered by a blackish film of secretion, which often extends a little over the exuviæ. I can not see the first skin on the orange exuviæ, but as often happens it is doubtless covered by secretion, and as usual in *Aspidiotus* the orange portion represents both larval skins. If the insect were an *Aonidia*, the blackish film should represent the second skin, and this certainly is not the case.

The almost lateral exuviæ and other characters presented by this species are very peculiar for *Aspidiotus*, but a closely allied form has been described by Mr. Maskell as *Aspidiotus theæ*. This latter infested tea in the Kangra Valley, India, and Assam, and has just the sublateral exuviæ, lattice work pattern of pygidium, and covering film of our insect. It will be distinguished, however, by the scale being light brown (ours is very dark), the film being white (not blackish), and several other minor characters.

In America there is no species very near to *duplex*, but an apparently new species shortly to be described by Mr. W. G. Johnson, found on *Æsculus californica* at Palo Alto, Cal., shows some superficial resemblance and has a similar covering film, though that is whitish. It differs at once from *duplex* in the position of the exuviæ, the obliquely truncate median lobes, the large conspicuous spines, etc. This species of Mr. Johnson's is probably related closely to the European *A. hippocastani* Sign. (which I have never seen), but I think he is correct in considering it distinct.

Genus CHIONASPIS Sign.

Chionaspis latus n. sp.

Female scale.—Similar to that of *Chionaspis aspidistræ*, but broader.

Adult female (cleared in potash and mounted in balsam).—Three-fourths mm. long, about one-third wide; lateral margins of segments somewhat produced, but the breadth of the produced portions greater than the length. Anal orifice rather large, round, level with the interval between the lateral groups of glands. Five groups of ventral glands, median of 8, cephalolaterals 20 to 23, caudolaterals 19 to 22. Length of caudolateral group $\frac{1}{500}$ inch; distance of hindmost gland of caudolateral group from base of median lobes $\frac{1}{490}$ inch; length of median lobes $\frac{1}{2250}$ inch. Median lobes brown; the others colorless, or almost so. Median lobes obliquely ascending to the median line, at which they are contiguous for their whole length, the two lobes together forming nearly the outline of a half circle. The descending external margins are thrice

deeply notched, thus becoming conspicuously crenate. Each lobe is deeply incised at its base, but except for this it would form a nearly right-angled triangle, the right angle being the inner basal one. The length of each lobe in the median line is about as great as its breadth at the base, or somewhat greater. Immediately outside each lobe is a spine, then comes a large plate, conical in outline; then a pair of lobes resembling in shape human incisor teeth, but more narrowed basally; then a long spine; then a pair of oblong plates, followed by what may be a very rudimentary lobe, marked at the base like the previous pair of lobes by a round, low prominence bearing a short hair; then after a short interval comes a low, broad serration on the margin, followed by a number of minute serrations, toward the end of which is another short hair springing from a round spot; after this comes a short interval and then a very long spine-like plate; then a prominence bearing a gland; then after an interval two very long, spine-like plates. The saccular glands along the margin, as in other species, are about twice as long as broad. Close to and parallel with the margin are seven transversely elongate pores, rod-like in form.

Habitat.—Tokio, Japan, on orange. (Takahaski; Div. Ent. Dept. Agr. No. 6490.)

Allied to *C. braziliensis* Sign., *C. theæ* Mask., and *C. minor* Mask., but scale much broader. *C. minor*, which it much resembles structurally, has a white scale. *C. latus* is quite distinct, structurally, from *C. citri.*

Chionaspis bambusæ n. sp.

Female scale.—About 2½ mm. long, pyriform in outline; snow-white, with the exuviæ pale straw color; second skin often tipped with orange. In all respects this scale so closely resembles *C. vaccinii* Bouché as to be practically indistinguishable. From the Ceylon *C. graminis* Green MSS. found on *Andropogon*, it is at once distinguished by the shorter second skin.

FIG. 5.—*Chionaspis bambusæ* (from drawing by Cockerell).

Adult female resembles *C. vaccinii* a good deal, but the four (two pairs) lobes are smaller, and the median ones narrower and not touching at their bases as in *vaccinii.* The ventral grouped glands are in five groups, as usual, but the orifices are much less numerous than in *vaccinii.* The oval (dorsal) pores are very large and distinct; adjacent to the lobes they form "incisions with thickened edges," as in some species of *Aspidiotus.* The spine-like plates are large; the margin cephalad of the fourth of these plates is serrate.

Habitat.—Tokio, Japan, on leaves of bamboo, July, 1894. (Takahashi; Div. Ent. Dept. Agr. No. 6609.)

The *C. vaccinii* used for comparison are on *Vaccinium myrtillus*, from Králové Dvůr, Bohemia (*Karl Sůlc*).

Parlatoria theæ n. sp.

Female scale.—On bark of twig, very inconspicuous, about $1\frac{2}{3}$ mm. long, oval in outline, slightly convex, pale ochreous, with the second skin black or nearly so. Second skin not far from circular, rather less than one-third total length of scale; first skin about half overlapping second. Removed from the twig, the scales leave a white mark, representing the so-called ventral scale.

Adult Female.—(Boiled in potash) colorless, with the lobes pale ochreous. Mouth-parts as usual in genus. Grouped glands present, caudolaterals of about 7 orifices, cephalolaterals of about 20, median

Fig. 6.—*Parlatoria theæ* (from drawing by Cockerell).

group represented by a single orifice only. Lobes of the type of *P. pergandei*. I find it almost impossible to adequately describe in words the abdominal fringe of this or any other species of *Parlatoria*, and so give a figure which will facilitate identification.

Habitat.—Japan, precise locality not stated; on tea plant. (Takahashi.)

The dark second skin, which is comparatively small, distinguishes this species; at a glance it looks not unlike *Aspidiotus camelliæ*. It is attacked by a fungus, of which, however, I have seen only the mycelium.

Phenacoccus pergandei n. sp.

Female with ovisac $8\frac{1}{2}$ mm. long, 3 broad. Ovisac white, firm, not grooved, partly overlapping the wrinkled, orange brown female.

Female (boiled in potash) turns the liquid a pale, port-wine color. Derm colorless, with numerous gland spots and some small spines. Antennæ and legs pale ochreous, comparatively large. Antennæ distinctly 9-jointed; 3 longest, 2 nearly as long and decidedly stouter; 1, 4, 5, 6, and 9 subequal; 7 and 8 subequal and shortest; formula 3, 2 (1, 4, 5, 6, 9) (7, 8); 1 with two stout hairs near its end, 2 with a long hair, 3 with a pair of hairs near the end; remaining joints each with a whorl of hairs; last joint with also apical hairs representing a second whorl. Legs ordinary; coxa very large, with a whorl of bristles near its end; trochanter and femur with scattered bristles; femur with an erect hair on its inner face, just before its middle. Tarsus less than half as long as tibia; tibia with about five bristles on its inner face and six on outer. Tarsus with bristles. Claw long, not much curved; digitules of claw of fair size, expanding rather gradually to their bulbous ends. Tarsal digitules wanting.

Habitat.—Japan, precise locality unknown, on "Gumi." (Takahashi; Dept. Agr. No. 5942.) The scales occur on the undersides of the leaves, along the midrib. What "Gumi" is, I do not know, but it has entire rather hairy leaves about 40 mm. long, suggestive of some solanaceous or scrophulariaceous plant.

At first sight the species looks like a very much developed *Pulvinaria camellicola*, but the texture of the ovisac suggests *Lichtensia*. I had actually described it as a new *Lichtensia* and had sent the MS. to Washington, when Mr. Pergande, having occasion to examine the insect, discovered the extraordinary error into which I had fallen. The specimens were much attacked by parasites (a species of *Comys*, I learn from Mr. Howard), and the legs, antennæ, etc., were detached. Thus, having gotten the erroneous idea that the thing was a lecaniid, I described from what I could see, notwithstanding the absence of the anogenital parts, etc. On receiving Mr. Pergande's statement, I boiled down a new specimen, and was fortunate enough to see the anal ring, perfectly normal for *Phenacoccus*, to which the insect unquestionably belongs. I mention these incidents because such errors are always interesting, throwing light on the probability of error in scientific writings. I have sometimes seen it stated that so-and-so could not have made a certain mistake, because he knew better; but a careful analysis of mistakes will show that a large percentage would not have been made if the writer had known less. For example, a traveler in a foreign country will often announce that he saw some bird or insect very familiar to him at home, and when it is denied that the species occurs there he will indignantly ask whether we suppose he does not know the common so-and-so. As a matter of fact, he has been misled by a superficial resemblance; whereas had the object been quite unfamiliar to him he would have taken pains to arrive at its correct identification, probably with success.